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Tables of Dielectric Materials Volume IV

Technical Report No. 57
Laboratory for Insulation Research
Massachusetts Institute of Technology

TABLES OF DIELECTRIC MATERIALS VOLUME IV

Laboratory for Insulation Research
Massachusetts Institute of Technology
Cambridge, Massachusetts

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Tables of Dielectric Materials

Volume IV

Laboratory for Insulation Research Massachusetts Institute of Technology Cambridge, Massachusetts

About five years have passed since Volume III of the "Tables of Dielectric Materials" was issued. The world situation appeared to quiet down at that time, and we hoped to concentrate the whole activity of this laboratory on fundamental research in the field of dielectrics (polarization, magnetization and conduction). The outbreak of the Korean War found our country again unprepared and demonstrated with expensive clarity that we have to live on the alert for the rest of our lives. In consequence, the laboratory felt bound to retain the practical task assumed in World War II of acting as a clearing house for dielectric materials and their uses. One aspect of this activity is our long-range applied research program of tailoring dielectrics to order for specific applications. This work is concentrated at the present time on the problem of shaping the hysteresis loops of ferroelectrics and of ferromagnetic semiconductors to the requirements of the electrical engineer concerned with the development of memory systems, dielectric and magnetic amplifiers and other nonlinear devices. A second aspect is the "Tables of Dielectric Materials."

The "Tables" in their present form summarize the measurements of this laboratory on the complex permittivity (dielectric constant and loss tangent) and the complex permeability of important dielectrics made in this country. They are intended to aid government agencies, engineers and manufacturers in the proper application of dielectrics and in the development of better products. Volume IV reports on about 250 new materials; simultaneously, it has taken over and amplified the measurements given in the previous volumes as far as they still are of special interest. A number of materials now not in produc-

tion have been retained for this reason but are indicated as "discontinued."

The total number of materials included amounts to over 600.

The selection of these materials was undertaken with the fell co-operation of the manufacturers concerned. The laboratory measures any important new material free of charge for inclusion in the "Tables" if the manufacturer supplies all additional essential information. If some of this information is "confidential," it is locked away in our files and will be made available only after release by the manufacturer.

We are fully aware that these data should be expended, especially towards higher temperatures and frequencies. Furthermore, additional measurements on d.c. conductivity, breakdown strength and other electric parameters would be of great value, and a presentation of the materials as in Volume II, where the dielectric characteristics of each individual dielectric have been plotted and essential information given on composition, properties, methods of handling and recommended uses. Finally, a real "dielectric analysis" of the materials should be undertaken, linking their dielectric response to composition and molecular structure. We have to ask for the indulgence of the users of these "Tables" on these scores; ultra posse nemo obligatur, or, in free translation, our budget is already stretched to the breaking point by our present obligations.

Volume IV does not contain our more extensive measurements on ferroelectrics and ferromagnetics. These data on nonlinear dislectrics will be issued in a separate Volume V as soon as they are reasonably complete.

The measurements were made by W. B. Westphal, group leader of our dielectric measurements group, who was shly supported by three staff operators: Helen M. Dunn, Patricia A. Pergus and Elizabeth McCarty. Invaluable help in the editing and correcting of the manuscript was given by Hariet B. Armstrong.

This work was sponsored under our O.N.R. contracts jointly by the Navy Department (Office of Naval Research), the Army Signal Corps and the Air Force

(Air Mati viel Command); we thank the three Se vices for their understanding and co-operation.

Laboratery for Insulation Research

Piglectric Parameters

- 1. ϵ' is the dielectric constant or permittivity relative to vacuum, also havir ated in the literature as K, κ , ϵ , D.C., etc.
- 2. $\tan \delta$ or $\tan \delta_d$, the dielectric loss tangent or dissipation factor, also designated in the literature as D.F., 1/Q, and when losses are low, as power factor or $\cos \theta$.
- 3. $\mu'_{(-1)}$, the magnetic permeability relative to vacuum, also given in the literature as μ' or μ .
- 4. ta: 3 the magnetic loss tangent.
- 5. P, 20 a.c. volume resistivity in ohm cm. This parameter is used in these tables only for very high-loss materials.

In ansformation to other parameters. The dielectric loss factor relative to vacoum, ϵ''/ϵ_0 , is the product of the dielectric loss tangent and ϵ''/ϵ_0 . A.c. volume of inductivity, σ , is given by

$$\sigma = \frac{1}{\rho} = \frac{f(\epsilon'/\epsilon_0)\tan \delta}{1.8x10^{12}}$$
 [who cm.] (f in c/s)

chart is given (page x) for approximate calculations of σ or ρ from the data given in the tables.

The magnetic loss factor relative to vacuum, μ''/μ_0 , is the product of the magnetic loss tangent and μ'/μ_0 (in analogy to the dielectric loss factor). In the literature, the loss factor is sometimes given as $\frac{1}{\mu_0^+Q}$ or in our notation, to 100, to 100, 100

: attenuation constant, a, for propagation in free space is

$$\frac{2\pi}{\lambda_0} \left[\frac{\mu' \epsilon'}{\mu_0 \epsilon_0} \frac{1 - \tan \delta_d \cdot \tan \delta_m}{2} \left(\left[1 + \tan^2 (\delta_d + \delta_m) \right]^{1/2} - 1 \right) \right]^{1/2},$$

sidch for nonmagnetic dielectrics reduces to

$$\frac{2\pi}{\lambda_0} \left(\frac{\epsilon^i}{\epsilon_0}\right)^{1/2} \left[\frac{\left(1 + \tan^2 \delta_d\right)^{1/2} - 1}{2}\right]^{1/2}$$

Charts for finding α in terms of $\varepsilon'/\varepsilon_0$ and $\tan \delta_d$ are included in this report (pages xi-xiii). They apply also to magnetic dielectrics when the product $(\mu'/\mu)(\varepsilon'/\varepsilon_0)$ is substituted for $\varepsilon'/\varepsilon_0$ and an equivalent combined loss tangent $\tan \delta_\theta$ is used instead of $\tan \delta_d$. A graph is given (page xiv) showing $\tan \delta_\theta$ for values of $\tan \delta_d$ and $\tan \delta_m$ in the range 0.1 to 10. For smaller values, $\tan \delta_\theta$ = $\tan \delta_d$ + $\tan \delta_m$.

The phase constant β for propagation in free space is

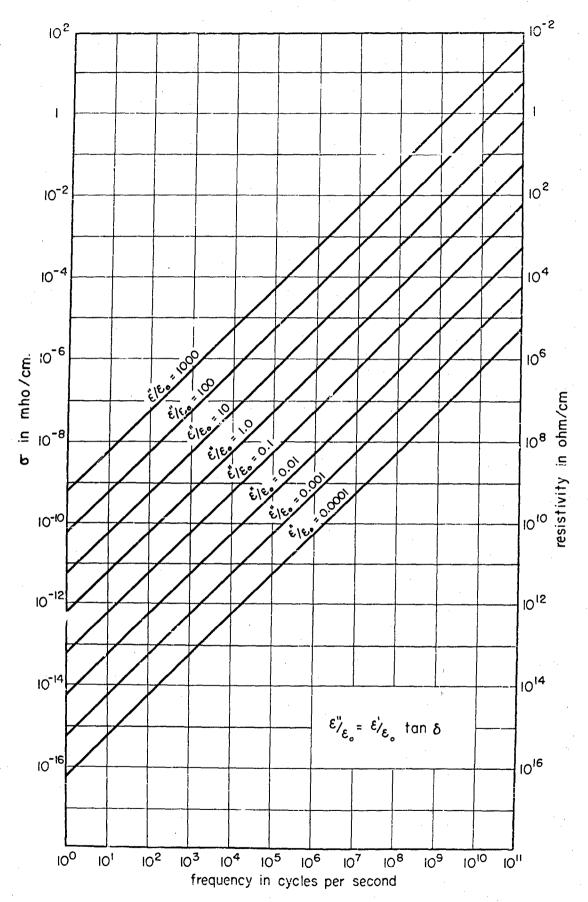
$$\frac{2\pi}{\lambda_{o}} \left[\frac{\mu' \epsilon'}{\mu_{o} \epsilon_{o}} \frac{1 - \tan \delta_{d} \cdot \tan \delta_{m}}{2} \left(\left[1 + \tan^{2}(\delta_{d} + \delta_{m}) \right]^{1/2} + 1 \right) \right]^{1/2}$$

which reduces for nonmagnetic materials to

$$\frac{2\pi}{\lambda_0} \left(\frac{\epsilon^1}{\epsilon_0}\right)^{1/2} \left[\frac{\left(1 + \tan^2 \delta_d\right)^{1/2} + 1}{2}\right]^{1/2}$$

The intrinsic impedance Z of the material is

$$377\left(\frac{\mu^{*}\epsilon_{0}}{\mu_{0}\epsilon^{*}}\right)^{1/2}$$



Conductivity-resistivity as function of ϵ''/ϵ_0 and frequency.

-0.01

0.02

0.03 0.04 0.05

10-

A. - WAVE LENGTH IN METERS

0.5 0.4

0.3

02

0.1-

0.05 0.04

0.03

0.02

0.01-

-10

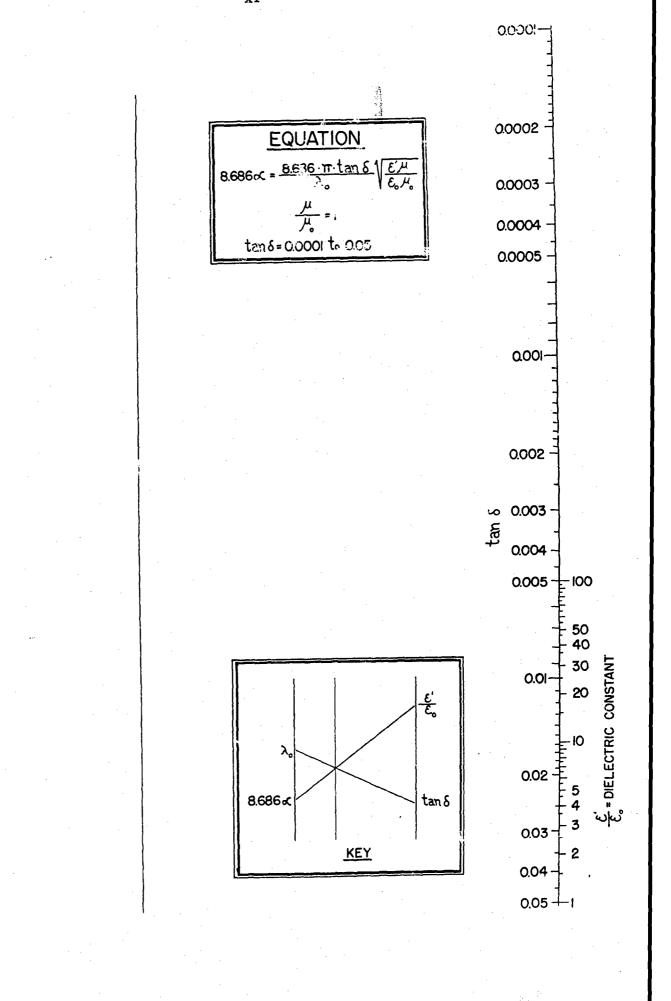
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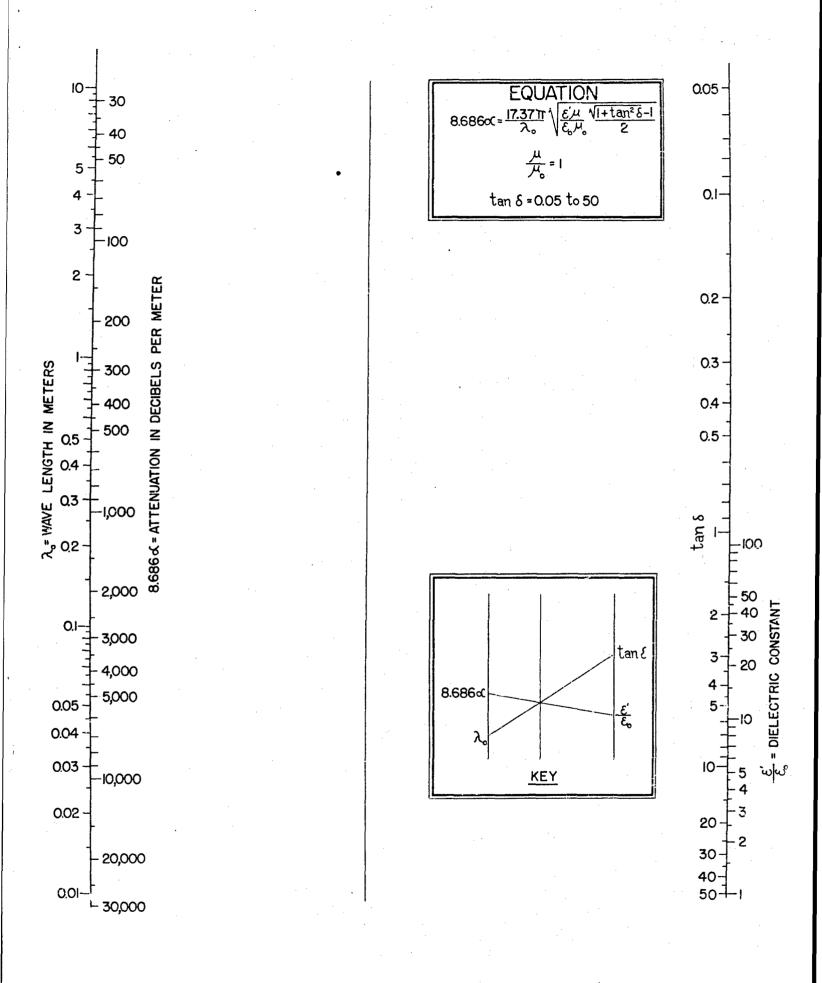
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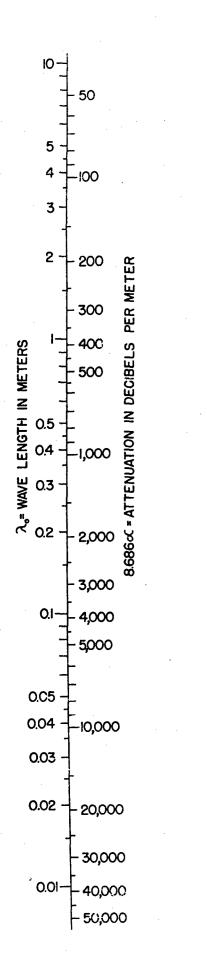
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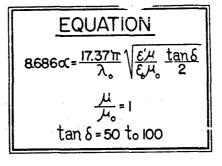
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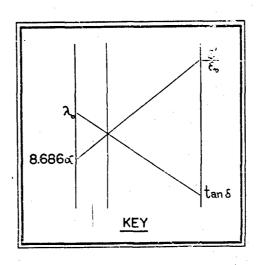
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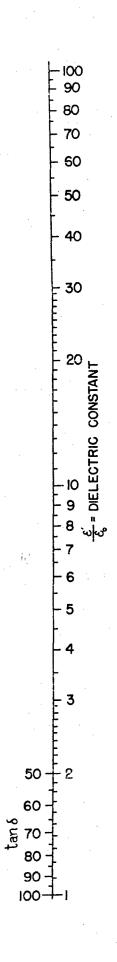


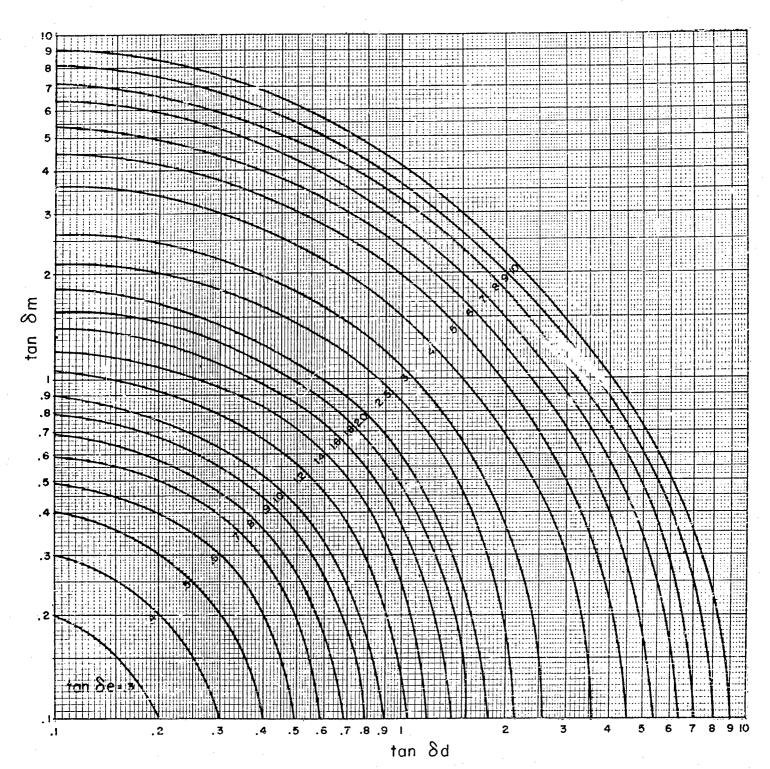












Equivalent loss tangent of magnetic materials.

Measurements and Accuracy

The measurements have been made, in general, on only one batch of the material and refer, unless otherwise specified, to samples dried over phosphorous pentoxide. Due to the wide variety of materials and improvements in techniques, no figures of general validity can be given concerning the accuracy of these measurements. For ϵ'/ϵ_0 , the nominal accuracy is $\pm 2\%$; the accuracy trends are toward $\pm 1\%$ for rigid, low-loss materials (tan $\delta < 0.005$) and $\pm 5\%$ for high-loss materials (tan $\delta > 1$). For tan δ_d , the nominal accuracy is $\pm 5\%$; for high-loss materials, the error may be $\pm 10\%$. For very low-loss materials (tan $\delta < 0.002$), the accuracy is ± 0.0001 when the losses are given as multiples of 0.0001. When the loss is expressed in multiples of 0.00001, the error may be ± 0.00003 . For μ'/μ_0 , the nominal accuracy is $\pm 5\%$, for tan δ_m , $\pm 10\%$.

Field strengths. The linear dielectrics, those normally not field-strength sensitive, were measured at field strengths of approximately 50 volts per cm. in the frequency range 10² to 10⁸ c/s and at lower field strengths at higher frequencies. At high temperatures (near 500°C) many of these materials show field-strength sensitivity, particularly at low frequencies. The effects may be wholly or partly due to space charge polarization.

The ferroelectric and ferromagnetic materials, unless otherwise noted, were measured at field strengths in their linear region. The values thus measured are the <u>initial</u> permittivity and permeability. Typical field strengths are 40 volts/cm. for titanate ceramics, 0.01 volts/cm. for KDP crystals, 0.01 cersteds for the ferrites.

I. SOLIDS

Values for tan 5 are multiplied by 10^4 ; frequency given in $\mathrm{c/s.}$

A. Inorganic	Values for tan 8	_	are multiplied by 107; frequency given in	lied by	10 ⁷ ; freq	uency gi	ven in	c/æ.				
	5 3	1x102	12103	11104	11105	30171	14107	11108	3x108	32109	121010	2.5x10 ¹⁰
1. V. Davis	6,/6					4.15	3.7		1 1		3.17	
		1				1200	180		! ! !		7	
(though	0 61/6	1	3.33			1.20	1.20		1.20		1.26*	
		!	1,920			215	O 1		15		* *	
	-6 e'/e	1	;			1.55	† : !		t 1 1			
	tan o		1 1			2900	1		:	6		
Aluminum oxide, eapphire 2	25 6'/6	8.6	8.6			8.6	9.6		8.6		:	8.6
		01 ×	(U V			< 10	< 10		< 1	t 1 1	:	† T
(field H option axis)	6,/6	10.55	10.55			10.55	10.55		10.55			
	ten &	< 10	۵۱ ۷			< 10	< 10		ר י			
Agmentium dihydrogen phos- 25	55 c'/e	₹95	56.0			55.9	55.9		55.9			
phate (field Loptical ax	•	Q ₂	94			۸ ر	۸ ۳۷		< 10			
(field H optical axts)		16.4	16.0			14.3	14.3		14.3	!	13.7	
•	ten &	2400	2110			8	10		'	!	20	
Lithium fluoride	25 6'/6		9.00			6.00	9.00		9.00	1	6.00	
			< 3			۵۱ ۷	α ∨		7.	1 .	1.8	
	80 e¹/e	9	9.11			9.11	11.6		1	1	9.11	
	ten 8					α ∨	α V		1 1 1	1	۳. ۳.	
Magnesium oxide	25 61/6					9.65	9.65	9.65				
	tan S					۳ ۷	რ V					
Potassium bromide	25 61/6					4.90	4.9		4.90	1	8.	
	tan B					α V	α V		ر ۷	!	ผ	
	87 e'/e					T6.4	16.4		16.4	1	16.4	•
	tan 5					5	m'		4.0	!	3.7	
Potassium dihydrogen	25 e'/e					144.3	4.43					
phosphate (field Loutical arts)	tan 8					< 5	۸ 5					
(Pietala II ontinol evie)	61/m					20.2	20.2					
(TIGIT I OFFICET STIE)	tan 6					ν Γ	۸ ۳					1
Selenium, multi-crystal-	25 61/6						1		0.11	10.4	!	7.5
line						!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1			1.540	1 1	1100
•	:						+40 +1		٠,	Linde Air. e. Brush.	Brush.	

a. From conjuctivity water. b. Freshly fallen snow. c. Hard-penked snow followed by light rain. d. Linde Air. e. Brush.

-0°0- *

f. Fresh crystals (Harshaw). g. Norten. h. Lab. Ins. Res.

I. Solids, A. Inorganic, 1. Crystals (cont.)

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121010											3.58	1.5							-							
32109											3.62	4.					٠.					.*				
3x108											;	!														
12108											;	!														e.
Tolat	8, ,	v (٠ چ	€ V							3.69	ณ V	30.3	4	21.8	ċ	37.3	820			32.5	ᡮ.	85.8	α	160	16
11106	8.7	V 6	2.78	ი ∨							3.69	∾ ∨	30.3	H	21.8	÷	:				32.5	4	85.8	C)	170	&
14105	8. %	, o	02.0	9	,						3.69	α ∨	30.3	ผ	21.8	1.2	;	:	31.8	5.9	32.5	37	8	#	170	009
1x10th	2.8	1 8	3	2							3.69	ณ V	30.3	13.3	21.8	15	1 1 1	;	32.0	94	32.5	277	4. 98	6	200	3500
11103	5.9 1	, נו א נו א	1	0 1 0	3.75	۸ 5	3.95	۸ 7	4.45	۸ ۱۷	3.69	a	30•3	128	21.8	120	!	: :	32.0	144	32.8	2800	7.98	32	!	į
14102	5.50 1	35		170	3.75	۸ 5	3.95	۸ ار	54.4	< 5	3.69	٣	31.1	1300	22.3	950	; ; !	!	32.9	4,500	32.9	29800	87.3	110	:	1 1 1
, 1	€'/€ ten S	e1/e	,0	tan S	ε'/ε°	tan 8	61/e	tan 8	e,/e	tan 8	e'/e	tan 8	ε'/ε _ο	tan 8	e'/e _o	tan B	e¹/€	tan 8	e,/e	tan 8	e'/e,		e'/e	ten 8	e¹/eº	tan 8
o ^D	S)	ž	3		25		52		25		25		25		25		193		25		25		25		25	
	Soulum callorium				Sulfur (100)		(010)		(001)		Sulfur, sublimed	•	Thellium bromide	q	Thellium fodide				The llium browide -	chloride	Thallium bromide -	lodide", 1	Titanium dioxide, rutile	(field L optical axis)	(field 11 optical axis)	

a. Fresh crystals (Harshuw). b. Measured with field I to cuts indicated. Grown at Lab. Ins. Res. c. U.S.P. d. Grown at Eng. Res. e. KRS-6, 60% ThBr, 40% ThC1. f. KRS-5, 42% ThBr, 50% ThI. g. Linde Air. and Dev. Lab., Fort Belvoir, Va.

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or contrast us another contrast					*							÷	
				•	values fo	Values for tan 5 are multipled by $10^{rac{1}{4}}$; frequency given in c/s.	are mult	ipled by	10 ⁴ ; f:	requency	given in	n c/s.	
2. Ceranics	T _C		1x10 ²	12103	14104	1x105	12106	1x107	1108	32108	32109	010121	2 5-10
a. Steatite Bodies													200
AlSiMag A-35ª	53	e,/e	6.10	5.96	5.89	5.86	5.84	5.80	5.75	1	5.60	! ! !	y 2
		tan 8	150	100	2	50	38	35	37	;	1	; ; ;	, , , ,
	£	e'/eº	1 8.9	6.37	6.11	5.96	5.86	5.80	5.75	;	5.50	٠	ξ.
q		tan B	830	370	175	103	77	20	2	:	24		
Alsimag A-196	25	e'/eº	5.90	5.88	5.84	5.80	5.70	5.65	5.60	; ! !	5.42	5.24	5.18
		tan 8	30	29	79.5	55	30.5	19	16	į	18	56	38
	81	e'/e	5.90	5.88	5.84	5.80	5.70	5.65	5.60	3 1 1	5.42		}
α		ten S	58	9	46.5	70.5	99	40.5	₹8	; t	18	•	
Alsimag 211	25	e,/e	00*9	5.98	5.98	2.97	5.97	5.96	5.96	1 1 1	1	, 9	
₹		tan 8	8	1 6	12	9	1	ᅺ	#	!	:	41	
Alsimag 228	25	e'/e	0 [†] .9	6.40	0 ф•9	6.40	6.36	6.30	6.20	!	5.97	5.93	5.83
		tan S	15.6	8	50	15.6	12.4	11.2	10	:	13	19.5	24
	81	ε'/ε°	6.52	94.9	0 1 .9	04.9	98.9	6.30	!	1	5.95		
ect		tan S	35.6	55	18	21.5	18.4	11.8	!	1 1	11		
Alstrag 243	55	e,/e°	6.30	6.30	6.28	6.25	6.22	6.17	6.10	1	5.78	5.76	5.75
		tan 8	12.5	4.5	0.4	,6 v	3.7	3.5	ю	!	9	8.5	12
	82	ε¹/ε°	6.37	6.37	6.37	6.36	6.32	6.28	! ! !	;	5.88		
Q		tam S	21	13.7	8.0	6 >	3.7	3.5	1	1	9		
Alsimag 393	† ₹	e'/e	4.95	4.95	4.95	4.95	4.95	4.95	4.95			₽.95	16.4
	٠	ten 5	38	53	16	75	10	10	10	;	1	7.6	14
Ceramic F-55	25	e¹/eº	6.22	6.22	6.22	6.22	6.22	6.22	6.22	į	6.22	:	6.2
		tan 8	14.5	6	ίΩ	ณ	н	1.5	က	1	5.5	!!!	נו
Scartte 17pe 302	25	e,/e	2.80	5.8	5.80	5.80	5.80	5.80	5.80		5.8	5.8	
been attaces		tan S	32	8	16	13	12	12	12		19	36	
Scarcice Type 400	25	e'/e	5.54	5.54	5.54	5.54	5.54	5.54	5.54	1	5.5	5.5	
10 To		tan 8	160	100	72	8	22	₹	39	1 2 1	39	53	
Steatite Type 410	25	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	;	5.7	5.7	
10		tan 5	55	30	16	6	7	9	9	:	8.9	દ્ધ	
Steartine Type 452	25	e'/e	8.15	8.15	8.15	8.15	8.15	8.15	8.15	:	8.15	8.15	
		tan S	65	28	17	12	10	10	10	1	80	31	•
ate.	ava). b.		93% A1203. 6% S	102.14	Sio ₂ . 1% MgO (Am. Lava).	Lava).	c. 60%	tale, l	5% kaoli	c. 60% tale, 15% kmolin, 17.5% BaCO2,	Baco ₂ ,		
/ Mgvo3 (Bell). a. Centralab.	alab.										n'		

(cont.)	
Inorganic	
A.	
Solids,	
. •	

I. Solids, A. Inorganic (cont.)	~			πο)ο.	404	To the state of th		4					
(+mos) softeness (a Trans	TOT TOT	o are ma	ıcıpılea	93 TO	; frøquer	ncy giver	ı in c/s.		
	c		c	•	-	Ľ	•	t	•	•			
a. Steatite Bodies(cont.) TC	EH I		1210	मि	107	े न	11100	1210	1x108	3x108	31109	1x1010	2,541010
Steatite Body 7292	25	e'/e _o	6.55	6.55	6.54	6.53	6.53	6.53	6.53	6.53	6.52	6.51	2
,		tan 8	ተር	7	8.4	3.9	6.4	5.0	6.2	8.9	, 0	900	
Crolite #29 ^b	1 7	e'/e	₩.0°9	40.9	40.9	fio.9	6.04	£.04	:		, %.	5.73	
		ten 8	25	19	15	13	11	10	1		. 1	1 0°	
b. Titania and Titanate											;	2	
Bodles							•						
Coramic NPOT96°	25	e'/e _o	29.5	29.5	29.5	29.5		29.5	29.5	8 5 6	:	28.9	
		ten 8	75	6.4	3.3	2.5		1.7	. a	!	:	2	
Ceremic N750196	25	e'/e ₀	83.4	83.4	4.58	83.4	83.4	4.58	4.58		8	83.4	
•		tan 8	5.7	4.5	3.5	2.5		2.3	9.4	1		14.6	
Ceremic NitoOTilo	52	e,/e	131	130.8	130.7	130.5		130.2	130.0				
•		tan 8	2.9	5.5	3.3	₹ .1		5.5	7.0				
Body T106	25*	£'/€	1518	1508	1480								
		ten 6	31	87	8								
	25**	e'/e	1308	1280	1260	1245	1232	1220	1210				
X		tan S	98	120	140	100	8	150	0Z4				
TI Pure R-200	56	e'/e,	100	100	100	700	100	100	100	1	1	8	
		tan 8	53	15	6.2	4	ю	2.5	2.5	1		&	
	28	e'/e _o	5.76	26	26	26	76	26					-
		ten 8	130	8	33	13	4.5	2.3		•			
Tam Ticon T.J, T.L	† ∂	e'/e	96	96	96	96	96	96	1		96	:	91
and T-M		ten 6	8	4.5	a	H	ณ	m	-	;	3.4	;	33
	78	e'/e _o	8	&	88.5	88	87.5	87					
:		tan 8	55	76	. ф	#	.#	.					
Tam floon MC	25.	€¹/∉ _o	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.8	13.8	13.7
		tan 8	15	11	6	7	-#	. 1	2	6	17	28	65
										1	,		•

a. Gen. Ceremics and Steatite. b. Al₂03, Si02, MgO, CaO, BaO (Crowley). c. Amer. Lava. d. Rutile (Dupont, fired at Lab. Ins. Res.). e. Rutile (Fitanium Alloy, fired at Lab. Ins. Res.). ** 0.2" disk cut from 3/4" disk. * - 3/4" Disk.

I. Solids, A. Inorganic (cont.)

Ceramics (cont.)

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Values for tan 8 are multiplied by 10⁴; frequency given in c/s.

b. Titania and titanate													
'sodies (cont.)	H _O H		11102	11103	1x10	1x105	12106	1x107	1x10 ⁸	32108	32109	1x1010	2 541010
Titania Ceramic	25	e,/e		:	1	1 1	33						
•		tan 8	1	1	i	1 1 1	5.5						
Titania Ceramic	23	e'/e,	‡ † !	1	!	;	. !	60.5	; ; !	8			
		tan 8	:	1	1 1	1	1	8.3	!!!	1			
Tem Ticon C	25	£'/€0	167.8	1.791	167.7	167.7	167.7	1.791	! ! !	166.8	165	165	
		tan 8		4. 4	2.5	Q	a	ผ	1	r	23	8	-
	8	e'/e°	157	156	156	156	156	156					
•		tan 8	100	64	Ħ	9	9	9					
Them Ticon S'd	25	e'/e	234	233	232	232	232	232	232	1	1	230	
		tan 5	51	Ħ	80	5	ณ	Н	Н	1 1	1 1	28	
Tam Ticon B	ઇ	e,/e	1240	1200	0711	1153	1143	1140	1	1100	8	150	100
4		tan 6	360	130	150	120	105	73		8	3000	2000	0009
Tam Ticon BS	25	e'/e,	8700	8500	8200	8100	8000	8000	8000	7000	2000	500	
(discontinued)		tan 8	230	500	-230	8	84	98	001	8	5000	0004	
Mix 71 Bario 8	. 25	e1/e	1740	1720	1680	1650							
		tan 8	63	107	170	150							
Mix 72 Barrio 3 9048	25	e'/e	1310	15.7	1300	1280	1275						
SrT103 10%		tan 6		143	2	77	54						
Mix 73 Bario 3 8048	35	£1/E°	2163	2160	2120	2020	1960						
SrT103 20%		tan 6	\$	155	280	200	72						
Mix 74 Bario 70.9%	25	e'/e	2990	2970	2910	2840	2820						
Srr10 ₃ 29.1%		tan 8		19	88	<i>L</i> 9	04						
Mix 75 Batto $_3$ 60%	52	e'/e	• •	1122	1120	1110	1090						
Srr103 40%		tan 8	011	72	₹.	30	19						

a. 64.3% T102, 11.1% MgC0₃ =4.6% MgC0310₂ (Lab. Ins. Res.). b. 84.6% T10₂, 15.4% MgColin (Lab. Ins. Res.). c. Calcium titanate (Titanium Alloy; fired at Lab. Ins. Res.). d. Strontium citanate (Titanium Alloy; fired at Lab. Ins. Res.). e. Barium titanace (Titanium Alloy; fired at Lab. Ins. Res.). f. 79% barium, 21% strontium titanate (Titanium Alloy; fired at Lab. Ins. Res.). 8. Thin sheet (Glenco).

Values for tan 8 are multiplied by 10 ; frequency given in c/s.

c	(toward and a second									÷		-	
ů		•											
	bodies (cont.)	C)		1x102	1103	11104	31105			17108	3*10B	_	,,,,10
	Mix 76 Pario ₃ 50%	20	6./6	740	738	735	732	730			<u> </u>	A :	
	SrT10, 50%		tan 8	10.7	9	7	เร			į	;		:
	Mix 77 Barrio, 68.1%	22	د ،/د	89.2	830	8	830			:	; !		ļ
	SrT103 28.1%		ten 8	1.6	10	35	25			!	!		!
	MgZrO, 2.8%						•						
	c. Porcelains												
	Ziroonium porcelain Zi-4	22	8'€	trt∙9	6.40	6.35	6.32	6.32	6.30	6.30	6.30	6.23	6.18
			tan 8	59	9	31	22	23	21	25	27	45	57
	Porcelain, wet process	52	6./6	6.47	42.9	6.08	5.98	5.87	5.82	5.80	5.75	1	5.51
			tan 8	280	180	130	105	8	115	135	140	. !	155
	Porcelain, dry process	ž,	£'/€	5.50	5.36	5.23	5.14	5.08	5.04	70.0	5.02	!	42.4
			tan 8	550	140	105	85	75	2	78	86	!	156
	Coors AI-200"	£	e,/e	8.83	8.83	8.82	8.80	8.80	8.80	8.80	1	8.79	8.79
			tan 8	†r	5.7	8.4	3.8	3.3	3.2	3.0	!	10	18
	Porcelain #4462	25	e'/e	8.99	8.95	8.95	8.95	8.95	8.95	8.95	8.93*	8.90	8.80
	•		tan 8	8	9.1	0.9	3.0	2.0	5.0	0.4	*	נו	47
	Coors AB-2	23	e'/e	8.22	8.18	8.17	8.17	8.16	8.16	8.16	!	6.14	8.08
			tan 6	8	13.4	11.4	10.5	0.6	7.5	0.6	1 1 1	16	27
	Albumag 491	33	e,/eº	!!!	!	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	!	8.74	# # #		!	8.60	8.50
	3		tan 8	!!!!	! !	; ; ;	1 1	22	1	1	1	17	23
	d. Miscellaneous Ceramics	삤										•	
	Beryllium oxide	22	€'/€°	4.61	74.4	4.47	48.4	4.28	42. 4	4.23	1 1	: :	4.20
		•	tan b	170	ಹೆ	47	72	38	19	12.5	!	!	
	rorons ceremic Ar-497	K)	¢,/¢°	‡ ‡ ‡	1		1	1 1	1	1	E	1 1 1	1.472
			ten 8	1	1	1 1 1		1 2 2	1	! !	! ! !		17

a. Thin sheet (Glenco). b. Coors. c. Knox. d. Aluminum oxide (Coors). e. Aluminum oxide (Frenchtown Porcelain). f. Aluminum oxide (Amer. Lava). 8. Norton. h. 63% diatomaceous-earth, 32% anthracite coal, 5.5% whiting (Stupakoff). Wrequency = 1x109.

I. Solids, A. Inorganic, 2. Ceramics (cont.)

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Frequency given in c/s; temperature = 25° C.

		tan 8							<.1	۲.>		۲. ۲.	۲. >	۲.>	۲.	.13	.32	1.61	4.46		2.48	
	Crowley BX114ª	, ομ/1μ	21		17.5	15.6	14.5		16	18.5		20.7	23	54	56	30	31	17.6	3.25		1.34	
	Crowley	ten S _d	.58		•30	.15	90.	420.	!	.007		! !	i	1	.0037	1		:	. !		<.01	
		e'/e,	53	19.2	19.2	14.9	12.9	12.6	1 1	12.4		1	! ! !				! ! !				12	
	*	tan S		1	i	6 5 6	-	!	<.1	5 12,47<.1,.02	<.2	12.8,46.05,.03	.25	94.	±7.	6.	1.15	1.5	3.4		1.9	
•	Crowloy BX1138*	ο η/ ₁ μ		!	14.5	14.5	14.5	7,7	13	12,	12	12.8,	51	4.64	37	1 6	28.5	17.9	5.34		1.74	٠
= 25.0	Crowlo	tan Sa	.59	1 1	8.	990.	420°	.010	i	.005		!		. !	9200.	!	t t 1	1	! ! !		<,012	
temperature = 25°C		¢,/¢			14.7	13.0	12.8	12.6	1	12.5	!	1	!		12.5			1	t		12	
n c/s; ten		tan 8		;	1	!	1 1	.28	1.53	₩2.	1 1 1	E 1 1	1.92	2.36	3.35	2.58	!	1 1	!		10.6	
given t		μ'/μ ο	400	!	001	004	004	O+1+1	147	8	:	1	4	59	18	21	!!!!	!	1		•19	
equency given in c/s;	Crowl	tan 8 _d	26.7	1 1	3.35	.78	₹9.	1	1 6 1	₹• E	-	1	1	!	1	!	:	!	1		1	
F.	٠	e'/e	000044	!	350000	250000	123000	! ! !	1	16400			1	1	1			!			건	
		tan S	!	1	!	1 1	1 1 1	!	90.	84.	! ! !	8.	1.16	1.58	2,15	1.98	1.43	! !	į	5.8	7.2	
	Crowley 208	η/"μ _ο	!	1	120	120	120	!	108	ಹೆ	1	24	35	5 4 .6	17.9	15.9	24.6	1	!	.98	.28	
	Crowl	ten 8	2,41	3.94	2.65	1.47	1.6	i	!	1.1	2	! ! !	-	1 1 1 1	1	! !			,07	20.	ਰਂ.	
		e'/e	35400	0066	5430	1590	08 [‡]	!	:	18	!	 - - -	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	 	1	1 1 1	!	1	15	12	12	
		Freq.	10.	4x10 ²	103	†o[ſģ,	10 ₀	3x10°	10,	2r10,	3x10	6.5x10'	9 1 10,	20,	1.2x10°	1.4 x 10 ⁰	3±10°	9110	109	3x107	

a. H. L. Crowley.

Two samples were measured; they differed as shown by the two sets of values at 10^7 and $3x10^7$. Lower μ^i/μ_0 values were obtained on sample cut from 2" disk, higher values on 3/4" disk. ϵ/ϵ values did not differ.

I. Solids, A. Inorganic, 2. Ceramics (cont.)

																				_	_						١٥.	i.	
		ten 8				<.05	.18	74.	.55	2.76	4.0	5.8	6.2			18.4				ଯ	1.0					.015	99.		
	de Da	_	86	380		510	550	565	114	112	52	17.7	12.9			1.09		٠		.15	1.9	Ferranic Ja	256	256	256	256	196	. *	
	Ferranic Da	ten 8 _d	aే	8.1		.77	1	8.	!	1 1 1	8.	1 1	!		2.9	3.1			,	3•3	1.35	Ferm	1	1.95	-37	.062	.015	*	
		61/6	35000	35000		17600	1 1	11000	1	1 1	0009	1 1	!		₹ 1	106				35	30		!	17.5	13.8	12.6	12.4		
25%.		tan Sa	1	1 1		.015	!	990.	:	:	%	1.6	2.7		1	. 61				8	1.26		!	!	<	•29	1.6	1.03	₽0.
*	de Ca	оп/, п	OĦZ	240		2 1 /2	259	267	:	!	195	78	33.5		1	16.8				.18	.51	Ferranic I	890	830	890	1050	215	10.7	8.
temperat	Ferranic Ca	tan S _d	4.5	1.4	н	1.32	:	1	1	:	2.0	1	! !			.70				1.14	•58	Ferre	2.9	ಕ.	3.1	4.7	2.1	411.	.012
in c/8;		e1/e	110000	32000	22000	13500	1	1	!	:	2850	1	1		1 1	1 9				5 ⁴ .6	18.7		12000	7800	930	8	56	13.6	12
Frequency given in c/s; temperature		ten 8	1			1	.027	!	:	į	•36	:	.67		:	1.12				07	.37		:	! !	1	.18	1.33	1	:
Frequenc	tte Ba	•		1 6	i	1	108	1	1	:	107	!	8		! ! !	1.41				.29	건.	Ferrentc H	720	720	720	6 9	300	1	i
•	Ferranic Ba	ten 8 _d	4.5	8.4	.78	59.		!	į	! ! !	2.9				:	1.56				89	.52	Forra	7.2	4.5	4.2	8	!	!	-
1. Solids, A. morganic, c. corange (care.)		e'/¢ _o																			15								
garman		ten 8		!	1 1 1	:	:	:		!	80.	.177		1.00	1.29	1.6	1.2	19.	2.0	2.0	. E		:	!	1 1 1	.05	99.	1	!
5 5	d, A o	η''μ _ο	19.6	9.61	19.5	19.4	20.0	88	;	23	54.5	25.4	8 3 8	12.5	7.2	2.8	8.0	3.0	1.0	٠,	1.0	mic Ga	450	00 1	360	340	245	!	!
(cent.)	Ferrami	tan S _d	.132	920.	9200.	.0032	1 1	:	!	!	9100.	! !		< . .	!!!	1	1	,	!	;	<.1	Ferranic G	-	9.	.216	690.	970.	1	i i i
errites		e¹/eº	8.8	9.30	9.13	8.99	!	!	1	!	8.87	į	1 1	8.5	!			8.5	1 6 3	;	8.5		1	23.5	15,5	13.6	13.0	1	ļ
1. 5011		Freq.	303	10#	105	106	2x106	3x106	4x106	7x106	107	22107	3x10 ⁷	5x107	100	3x10 ⁸	5x108	109	22109	3109	1010		103	104	105	90T	107	3xio ⁶	3x10 ⁹

a. Gen. Ceremics and Steatite. b. Data partly from Rado, Wright and Emerson, Phys. Rev. 80, 273 (1950).

I. Solids, A. In	Inorganic (cont.)	Values	e for ter	16 are m	multiplie	ed by $10^{\frac{1}{14}}$; freque	frequency given in c/	n in c/s				
3. Classes	O.H.		11102	12103	1410 t	ुलम	1210	12107	30121	31108	32109	11010	2.5±1010
Phosphate Glass	1ass 25	° / •	5,25	5.25	5.25	5.25	5.25	5.25	5.24	5.23	5.17	8.6	69
#2043x8		tan 8	R	81	1 6	15	41	16	80	8	9	2	ر بر
Phosphate Glass	13488 25	e'/e,	4.92	4.92	7.32	26.4	4.52	26.4	4.92	! ! !	0,4	o 4	, ,
#2279x ^D	•	tan 6	56	19	16	14	1,4	13	1,	;	18	19	, ç
Borosilicate Glass	e Glass 25	6'/€ ₀	4.05	4.05	4.05	4.05	4.05	4.05	4.05	;	4.05		;
		ten 8	13.6	8.6	1. 4	4. 4	5.8	7.0	8.0	1	30.6	15.5	
Corning 0010	45 ·	e,/e°	6.68	6.63	6.57	6.50	6.43	6.39	6.33	; ;	6.1	5.96	5.87
		tan B	71.5	53.5	35	23	16.5	15	23		8	8	011
coming 0014	25	e	6.78	6.77	92.9	6.75	6.73	6.72	6.70	69.9	1 1	9.64	i
		ten 8	23.1	17.2	14.4	12.2	12.4	13.8	17.0	19.5	1 1	70	
Corning 0080	23	° / c	8 . 30	7.70	7-35	7.08	8.9	6.92	6.75	***	6.71	6.71	6.62
		ten 8	28	00 1	550	140	100	85	8	!	126	170	180
Corning 0090°	ر ہ 20	ε'/ε ₀	9.15	9.15	9.15	9.14	टा. 6	9.10	9.02		8.67	8.45	8.25
	عم	ten 8	ង	80	7	2	80	75	13	1 1 1	₹	103	122
Corning 0100	0" 25	e,/e°	7.18	71.7	7.16	7.14	7.10	7.10	7.07	;	2.00	6.95	6.87
•	•	tan 6	4 2	16	13.5	13	1,4	7.7	78	1	∄	છ	106
Coming 0120	23	e 1/e	6.15	02.9	99*9	6.65	6.65	6.65	6,65	; ! !	1 9.9	9.60	6.51
),		tan 8	9‡	30	8	17	215	13	18	1	14	63	127
20//I Surmon	25	د ا / و	6.25	91.9	6.10	6.03	6.00	6.00	9.00		5.95	5.83	5.44
		tan 6	49.5	Z†	33	56	23	34	38	1 1 1	26	ಪ	140
0661 B UTUSO	. 24c	e'/e	8.40	8.38	8.35	8.32	8.30	8.25	8.20	1	7.99	46•1	7.84
		tan 8		i	٣	#	5	7	6	:	19.9	2 1	112
Corning 1991	†2 1 1 1 1 1 1 1 1.	e'/e _o	8,10	8.10	8.08	80.8	8.08	8.06	8.00	;	7.92	7.83	
•	÷	tan S	12	6	9	5	7	1	12	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	38	51	•
Corning 3320) 24	e'/e	5.00	€6•4	4.88	£.82	ó 2. 4	4.78	14.77	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	72. 1	4.72	4.7
		tan 6	&	28	ft3	34	30	30	32	1	55	73	120
coming 7040	25	e'/e	₫	4°-82	4.79	1.77	4.73	14.70	4,58	1	19.4	79.4	4.52
		tan 5	50	34	25.5	20.5	19	25	27	1	∄	57	73
corning (050°	25	e,/e	¥.88	±8.4	# 8.	. .80	4.78	92.4	7. ñ,	1	47.4	4.71	†9 ° †
- por	•		1 8 .	26	£ 1 7	33	27	28	35	1	52	61	83
a. Conceins & iron oxide (Am. Ortical).	oxide (Am. Ortical)	. b. Alum	minum-zinc		phosphate. (ca	1. 70% P	205) (Am.	Optical)	. 0. 7	73.24 510,	2,24.8%	B203 (Components	aponents

and Systems Lab., Air Materiel Commend). d. Scda-potash-lead silicate ca. 20% Pbo. e. Lead-barium glass. f. Scda-lime-silicate. g. Potash-S102, 14% K20, 6% Na20, 3% PbO, 5% CaO (iron-sealing glass). n. Soda-potash-borosilicate. o. Soda-potash-borosilicate. p. Soda-borosilicate lesd-silicate. h. Potash-soda-berium silicate. 1. Scda-potash-lead-silicate. j. Lime-alumina-silicate. k. Iron-sealing glass. m. 45% (ca. 70% SiO₂).

I. Solids, A. Inorgenic (cont.)	t.)	Valu		tan 8 are multiplied by	multipl		10 th ; freq	10 ; frequency given in		c/8.			
3. Glusses (cont.)	o _{El}		12102	12103	12104	न्म02	1210	12107	12108	3x108	32109	111010	2.5x10 ¹⁰
Corning $7052^{\rm th}$	23	e'/e _o		5.18		5.12	5:10	5.10	5.09	1	5.04	4.93	4.85
		tan 8		64		56	なる	28	₹		58	묪	114
Corning 7055	25	e'/e _o		5.41		5.33	5.31	5.30	5.27	5.25	!	5.08	
	-	ten 8		36		28	28	53	38	64	:	130	
Corning 7060	25	e'/e _o		16.4	•	4.8 6	# 8. #	48.4	₹.4	:	28.4	8.4	4.65
•		tan 8		55		Q.	36	30	90	1	77	86	8
Corning 7070°	23	e'/e _o		00° 1		4. 00	00°†	00° 1	00°#	٥٠° *	00.4	00.4	3.9
		tan 8		ľ		9	ထ	11	12	12	12	21	E
	100	e¹/€		4.16		41.4	4.13	4.10	!	!	00° #	۰ 4	•
		tan 6	20	22		97	6/	11	1 1	:	19	ส	
Corning 7230 ^a	25	e'/e°	3.88	3.86		3.85	3.85	3.85	!	1	3.75		
		tan S	33	23		13	11	12	1	1	52		
Corning 7570	25	e¹/e°	14.58	14.56		14.53	14.52	14.50	14.42	14.41	:	14.2	
		tan 8	11.5	13.5		16.5	19.0	23.5	•33	7.	!	86	
Corning 7720	5 th	e'/e _o		4.70		1 9° 1	79.4	19.4	! !	1	!	4.59	
•		tan 8		걸		55	80	23	!	. [£ 1	
Corning 7740	25	e'/e	08° 1	4.73		09°†	4.55	4.52	4.52	! ! !	 	4.52	6.50
•		tan 8		98		₹	61	45	45	1 1 1	! !	86	96
Corning 7750	25	e1/e		ट ग •म		14.38	4.38	4.38	!	† 2 !	4.38	4.38	
		tan 8		33		50	18	19		1	: F 1	45	
Corning 7900°	8	د ا/و	3.85	3.85		3.85	3.85	3.85	. !	3.85	3.8€	3.85	3.82
		tan 8		9		9	9	9	1	9	6.8	4.6	13
	100	e'/e _o	3.85	3.85		3.85	3.85	3.85	1 1 1	3.85	3.84	3.82	
		tan 8	37	17		10	8.5	7.5		7.5	10	13	
Corning 7911	25	e'/e,	-	1 1		1 1	1		i	; ; ;	!	3.82	
		ten 8	1 1	!		1			!	!	1 1	6.5	
Corning 8460"	25	e1/e	8.35	8.30		8.30	8.30	8,30	8.30	:	8.10	90.8	8.05
•		ten 8		6		7	80	97	16	!	O 1	57	8
Corning 8830	25	¢1/e0	5.38	5.28		5.11	5.05	5.01	5.8	76°n		4.83	
		ten 8	₹ 02	130		23	8	ተረ	57	63		66	
	- +												

a. Soda-potash-lithia-borosilicate. b. Soda-borosilicate (Pyrex). c. Low alkali potash-lithia-borosilicate. d. Aluminum borosilicate. e. Soda-lead borosilicate. f. Soda-borosilicate (ca. 80% SiO2). g. 96% SiO2. h. Barium borosilicate.

I. Solids, A. Inorganic (cont.)	ont.)	Values for		are mul	tipliod b	tan 8 are multiplied by $10^{\frac{1}{3}};$ frequency given in c/s.	equency	given i	n c/8.				
3. Glasues (cont.)	SH C	٠.	11102	14103	4011	12105	1210	12107	12108	32108	32109	111010	2.5x1010
Corning 8871	25	د./د	8.45	8.45	8.45	8.45	8.45	8.43		8.40	8.34	8.05	7.82
		tan 8	18	13	6	-	9	7	!	† T	56	61	2
Corning 9010		e./e°	6.51	6,49	6. 48	6.45	मम 9	6.43	6.42	04.9	1	6.27	• ,
		ten 8	50.5	36.2	26.7	22.7	21.5	22.6	30	14	1 3 2	16	
Corning Lab. No. 1890S	25	e'/e _o	19.2	19.2	19.2	19.1	19.0	19.0	19.0	# # #	17.8	١	
,c		tan 8	12.5	13	16.5	21	23	37	52	į	124		
E Glass	23	e'/e _o	6.43	04.9	6.39	6.37	6.32	6.25	6.22	1 1	!!!!!	6.11	
c		tan 8	24	34	27	18	15	17	23	1	!	3	
Founglas	23	e¹/e	0.06	82.5	68.0	0.44	17.5	0.6	!	t t t	;	5.49	
		tan 6	1500	1600	2380	3200	3180	1960	:	ļ		455	
Fused Silica 915c	ςς Έ	e,/e°	3.78	3.78	3.78	3.78	3.78	3.78	3.78	3.78	1	3.78	
7		tan 8	9.9	5.6	1.1	4.0	0.1	0.1	0.3	0.5	-	1.7	
Fused Silica 915c d, e	25	61/6	3.78	3.78	3.78								
4		tan 8	0.08	0.13	< 0.05								
Fused quartz	25	6,/6	3.78	3.78	3.78	3.78	3.78	3.78	3.78	1 1	3.78	3.78	3.78
		tan S	8.5	7.5	9	4	ત	н	٦	!	9.0	H	2.5
Sode-Silica Glasses													
9% Na ₂ 0, 91% 810 ₂	25	e,/e°	4.9	6.2	5.7	!	5.4	;	t 1 1	5.1	! ! !	5.05	4.9
			2500	820	001	1	130		1	100	1 1 1	130	160
12% Na.20, 83% S102	S.	e' /e _o	8.2	2.9	6.1		5.6	:	!	5.5	1	5.15	5.04
			1900	009	300		150	;	:	100	!	155	170
16% Na.20, 84% S102	S)	e'/e	ቱ •6	7.4	9.9	6.2	5.9	5.7	1	5.5	i	5.27	•
		tan 8	3000	096	200	250	165	130	1	110	i	180	
20% Na.0, 80% S10.	S)	e,/e°	10.8	8.3	7.3	6.8	9.9	6.3	t ; ;	5.9	:	5.6	6.1
			0001	1500	670	360	550	180	!	140	:	200	580
25% Na ₂ 0, 75% S10 ₂	252	e,/e°	13	2.6	8.4	1	9.7		1.1	2.9	1	6.3	
1			0029	2400	1000	1	310	1	1	170	1 1	220	
30% Na20, 70% S102	35		18	12	10.4	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	8.5	3 1 1	1	7.5	1	7.2	0.7
		tan 8	11000	3900	1300	:	001	! ! !	. !	190	1	240	350
a. Alkaline lead silicate.	b. Ovens	b. Ovens-Corning.	υ	. Soda-11me (Pittsbur	Pittsburg	gh-Corning)	d.	S10, (C	S10, (Corning).	e. Sam	e. Sample B-13	35.	

b. Owens-Corning. c. Soda-lime (Pittsburgh-Corning). d. S102 (Corning). e. Sample B-135. f. SiO₂ (General Electric). g. Composition in mole % of oxides as mixed (Lab. Ins. Res.).

I. Solids, A. Inorganic (Cont.)		Values f	or tan 8	are multi	plied by	Values for tan 8 are multiplied by 10^{1} ; frequency given in c/s.	douence	given in	c/B.			
3. Glasses (cont.) Alkali-silica glasses	C LI		12102	12103	1110	12105	12106	12107	14108	32108	3109	1x1010
12.8% 11.20, 87.2% S102	55	e,/e	46.6	45.9	5.45	5.1	4.95	4.92	! !	6.4	;	03 1
		tan 8	9700	3600	1000	310	174	124	!	62	ł	801
12.8% Na ₂ 0, 87.2% S10 ₂	25	ε'/ε _ο	8.09	6.61	6. 00	5.8	2.66	5.57	i	7.0	ļ	5.33
		tan 8	3050	1370	0 <u>5</u> 4	240	159	126	!	118	1	, 8 8
12.8% K ₂ 0, 87.2% S10 ₂	22	e./e°	7.53	6,49	6.25	6.17	60.9	6.02		5.8	1	5.8
		ten 6		360	200	121	8	8		8	!	, &
12.8% K20, 87.2% S102	52	£1/€		6.63	6.30	6.12	6.10	6.08		5.95	1 1 1	5.75
Quenched		tan 8		0 2 †	270	160	119	103		901	: :	240
12.8% Rb20, 87.2% S102	25	6' /€		5.32	5.23	5.22	5.21	5.20	!	5.15	! !	5.05
		ten 8		89	58	94	17	38		26		120
6.4% L120, 6.4% Na20,	23	e'/e		5.08	5.05	5.05	5.04	5.03	1 1	5.00		2.3
87.24 S10 ₂		tan 8		81	L#	28	19	17	! ! !	56	1	25
6.4% L120, 6.4% Na.0,	32	e'/e		5.09	5.05	5.05	5.04	5.02		86.4	1	46.4
87.2% S10 Quenched		tan 8	150	8	Ł †į	27	19	21	1	31	!	57
3.3% L120, 6.6% K20,	(S	e'/e	5.23	5.19	5.17	5.15	5.14	5.10	!	5.07		5.0h
71% 5102		tan 8	53	Ľ †t	37	58	42	† ₹	:	9	;	83
3.3% L120, 6.6% K20,	52	e'/e	5.38	5.35	5.28	5.26	5.23	5.20	;	5.15	1 1	5.08
91% S102 Quenched		ten 8	102	47	1	30	30	33	1	617	1 1	102
5.4% Na.20, 6.4% X.0,	52	e'/e	5.68	5.62	5.58	5.56	5.56	5.54	:	5.51	:	5.50
87.24 5102		tan 8	102	22	겉	31	25	23	-	9	; ;	115
4	ઇ	e'/e	5.70	5.62	5.58	5.56	5.56	5.55	!	7.7		5.53
87.2% S10, Quenched		tan 8	129	89	24	36	33	34	;	‡	!	160

a. Composition in mole % of oxides as mixed (Lab. Ins. Res.)

T. Solids A. Inorganic (cont.)		alues for	tan 8 a	re multip	11ed by	10 ⁴ ; fre	Tuency &	given in	c/8.				
4. Mcs.	E+t		°c 1x10 ² 1x10 ⁴ 1x10 ⁵ 1x10 ⁶ 1	12103	12104	11105	901मा	70121	801	32108	34109	1,1010	2,541010
Mycalex 28218	25	61/6	7.50	7.50	7.50	7.50	7.50	7.45	7.45			7.09	
(discontinued)		tan 8	8	28	17	13	70	6	. 6	3 3	!	27	
Mycalex 400 ^b	25	€¹/€°	24.7	7.45	24.7	7.40	7.39	7.38	1	:	\$ 2 0	7.12	
	,	ten 8	82	19	91	4 1	13	13				33	
	&	e'/e _o	4.6	7.59	7.54	7.52	7.50	7.47	1	1	:	7.32	
		ten 8	150	86	ደ	80	16	41	# !	}	!	57	
Mycalex K10 ^c	₹	e'/e	9.5	9.3	9.2	9.1	0.6	0.6	!!!	1 1	11.3*	11.3*	
		ten 8	170	3.25	92	24	56	23	!	!	2	₽	
Mykroy Grade 8 ^d	25	e'/e	6.87	6.81	92.9	4 ሬ-9	6.73	6.73	6.72	1	6.68**	**96°9	99.9
		ten 8	95	99	£4	33	56	470	25	1	38	6	ස්
Mykroy Grade 38 ^d	8	61/6	1.7	69.2	19.2	7.61	7.61	7.61	1	-	7.68**	8.35**	
		tan 8	1	33	27	켮	เร	14	1	1	33	3	
5. Miscellaneous Inorganics											i I		
Ruby mica	56	e./e	₹.5	₹•€	₹•€	5.4	5.4	5.4	5.4	5 5 1	ر اح		
		tan 8	25	9	3.5	m	m	m	a	;	m		
Canadian mica	82	61/ 60	0°.9	06°9	6. 9								
(field L sheet)		ten 8	15	ณ	н			٠					
(field H sheet)	80	e 1/e	11.5	8.7	7.3								
•		ten 8	2300	86	00 1								
Warble S-3030 (after	25	e,/e°	15.6	12.8	11.4	10.6	10.0	9.5	9.1	8.8	1	8.6	
drying over P_2O_5		ten 8	2000	1100	630	390	360	370	290	250	1	120	
(after baking)	3	e¹/e	9.45	24°6	9.29	9.25	6.07	8.98	8.85		! !	8.53	
		tan 8	180	130	ᄧ	15	110	120	120	}	1	110	
(after 60% humidity	23	e'/e _o	ŀ	!	1	1	1	9.35	8.95				
LOF 3 WORKS)		tan 6	1 1 1 1	1	1	i	;	500	250				
Selenium, amorphous	25	e,/e°	00°9	00°9	6. 00	9°00	9.00	00.9	00.9	0.9	00.9	00.9	9.00
,		tan 5	18	#	× 3	< >	۳ ۷	о V	ر ا ا	< 7	1.8	6.7	13
Quinterra (Non-monday of End man)	25	e'/e	5.75	۱ .80	1.4	3.3	3.1						
(Medauted at 70% Kills)		ten 8	1770	1500	1240	238	250						
Quinorgo #30001	52	e,/e	8.75	4.9	0.4	0.4	3.3			•			٠
(Measured at 50% R.H.)		tan 8	Ω %	2310	2150	1350	870						
B. Mich. Place (Can Riac.)	, ,		(Mar. 2)	•	•				•	; ; ;	•	•	

e. Muscovite. f. Class A (Tenn. Marble). g. Amer. Smelt. and Refining. h. Asbestos fiber, chrysotile, Type I (Johns-Manville). a. Mica, glass (Gen. Elec.). b. Mica, glass (Mycalex). c. Mica, glass, TiO2 (Mycalex). d. Mica, glass (Electronic Mech.). 1. 85% chrysotile asbestos, 15% organic material (Johns-Manville).

*Not corrected for variations of density. **Samples nonhomogeneous.

<pre>e'/e tan 5 e'/e tan 5 e'/e tan 5 tan 5</pre>	1102	o ² 1x10 ³ 1x10 ⁴	1110 ⁴	Multiplim.	ea by 10	1 1107	1x105 1x106 1x107 1x108 3x108 3	7en in c/	12109	01015
<pre>e'/e tan 5 tan 5 tan 5 tan 5 tan 5 tan 5</pre>	11102	11103	2.75		12106	12107	30171	32108		0101-1
<pre>e'/e tan 5 e'/e tan 5 e'/e tan 5 tan 5</pre>	0 10		2.73			1				
tan 5 e'/e tan 5 e'/e tan 5	3.46	2.9	•		2.59	2.55	1	2.55		2.53
 e'/e_o tan S e'/e_o tan S 	961.	90•	π ξο•		.017	•016	;	00100		•0036
tan 5 e'/e tan 5	3.23	2.72	2.50		2.50	2.50	;	2.50		2.50
e'/eo tan S	₫.	.13	950.		.025	.025	į	.026		.065
tan 8	:	1	1		07.4	4.50		4.50		3.60
	į	1500	!!!!		1.75	ņ	;	93		31.
e' /e _o	:	!	!		80	8	1	50		13
tan 8	!	3425	367		. ‡	.35	; ; ;	•03		.29
e¹/eº	3.06	2.83	5.69		2.53	2.48	1	74.S		4.5
tan S	٠٥٧	રું	.035		.018	410.	1	.0065		4100.
e'/e	i	!	18		6.9	. 1	!	3.5		3.50
tan 8	1 1	2.1	1.6		•65	54°	į	90°		•03
e,/e°	1	;	† † †			14.5	1	8		13.8
tan 8	1 1 1	8490	970		-	1.3	!	91.		.18
e'/e ₀	4.73	3.94	3.27		2.57	न्दे .		2.38		2,16
tan 8	.12	51·	.12		.065	10.	1	.020		.013
€¹/€°			; :	1	! ! !	21.6	t 1 1	8	11.3	
tan 8	:	7800	1000	1 1	:	1.7	!	.52	25	
η''μ _ο	;	:	1 1	!	1.09	1.09	!	1.09	1.005	٠
tan S	1		!!!	!	!	1	1 1	.025	660*	
e1/e	3.95	3.75	3.62		3.50	3.60	! !	3.50	3.50	
tan S _d	140.	•059	•025		.015	.012	1 1	.018	.022	
e¹ /ဧ	!	!	1	1	12	10	1	0.6	8.3	
ten 8 _d	;	o = 2	10 ⁵ ohm	CE	6	1.0	, !	12	.22	
c,/e	!!!!	1	1	1	1	30	1 1 1	30	30	
tan S _d		D = 0	, mdo *0.	Ħ	1	#	!	ςi	33	
e'/e _o	45.4	4.32	4.30	4.30	4.30	4.29	3			
	•0031h	.0022	.0019	£100°	.0017	.0018				٠
ਂ ਵਾਰਾਹ	3.06 .07 .07 .12 .12 .041 .041	3.750 3.948 3.949 3.949 3.949 3.75 3	a di di	1500 3425 367 2.83 2.69 .05 .035 .05 .035 .05 .035 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .02 .03 .03 .03 .03 .03 .03	· ·	O	5.0 2.60 3.60 3.52 .017 .017 .017 .017	5.0	5.0	5.0

a. Bentoalte with organic binder (Aircraft Marine).

I. Solids, B. Organic, with or without inorganic components - Values for tan 5 are multiplied by 104; frequency given in c/s.

2.5x10 ¹⁰					3.21	82			•			•												3.55	3%
1x10 ¹⁰			28.5	†	1				2.74	2.7	•													3.68	014
3×109			2,86	18	1 1 1	1	2.8	2.1	1 1 1		2.83	0.7	2.95	2,1										3.70	438
3x108			2.89	39		\$ 1 1	;	-		1 4 1	! ! !		1											1	
12108			2,89	58	3.35	17	!	!	!	1 2 5 4	2,86		ization)	ου V			٠	2,41	80	2.79	1.0			3.95	380
	5.64		2.89	17	3.43	011	2.85	Q	2.8	u v	2.86	10.1	crystallization)	δ \ \	2.64	9 V		2,41	13	2.79	1.5			4.16	350
12106	2.6h	4.5	2,89	50	3.47	120	2.85	m	2.8	9	2,86	9.5	gree of a	о V	2.64	۷ ۷		2.41	18	2.79	ਾ ਹ			4.36	280
11105	₹9°2	9	2.9	身	3.51	185	2.85	ī	8.8	6.3		1	O depending on degree of cry	۷ ۷	2.64	۳ ۷		24.5	8	2.79	4			4.50	210
12104	2.64	ជ	2.93	200	3.56	350	2,85	6	2,8	0.9	2,86	4.5	dependir	H	5.64	c u		2,42	16	2.79	9.9			4.62	200
11103	2.6h	8	3.09	8	3.76	260	2.85	19	2.8 2.8	1.7	2,86	4.5	.95-3.20	Q	75°0	3.5		2.43	#	2.80	17			11. t	280
11102	2.64	36	3.80	2600	4.19	애디	1	!	2.8	3.7			(2		5.64	‡7		2.43	۲ ۷	2.81	145			4.87	300
	¢,/¢°	ten 8	¢,/¢°	ten 5	د./د	ten 8	¢,/¢°	tan o	¢./¢°	ten 8	¢:/¢°	ten 6	د./د	ten o	e1/e	ten 8		61/6	tan 8	e'/e	tan 6			د./د	ten 8
e C	56		25		25		52		25		જ		25		25			25		52			· e o !	25	ted)
1. Crystals	a-Trinitrotoluene		a-Trinitrotoluene at	ca. 20% humidity	Senticizer 9 ^c	•	Naphthalene		Orthoterphenyl		Metaterphonyl		Paraterphenyl 9	•	Aroclor 1268		2. Simple Noncrystals	Aroclor 54608		Aroclor 4465 ^a		3. Plaetice	a. Phenol-formaldehyda	Bakelite BM-1201	(preformed and preheated)

a. Chem. Lab. M.I.T. b. War Dept., Picatinny Arsenal. c. o- and p-coluene sulfonamides (Monsanto). d. Eastman Kodak: recryst. and regubl. Lab. Ins. Res. e. Monsanto, recryst. Lab. Ins. Res. f. Nonachlorobiphenyl (Monsanto). g. Nonachloroterphenyls (Monsanto). 1. 46% wood flour, 8% misc. (Bakelite). h. Chlorinated mixture of biphenyl and terphenyl (Monsanto).

Solids, B. Organic	(cont.)
Bolids, I	3. Organic
	Bolids, 1

3. Flastics (cont.)				Values	for tan 8	for tan 8 are multiplied	tiplied	by 10 ⁴ ;		frequency given in c/s	•		
	o ^D		12102	14103	40171	1410,	14106	1x10 ⁷	1x108	3x108	3109	121010	2.5x1010
Bakelite BM-120		د،/د٥	5.50	5.15	06.4	4.65	4.45	η·30	:	i		3.55	
(not prefermed or		tan 8	047	9 1	345	350	350	415	: : :			28	
preheated)													
	57	e' /e ₀	7.80	6.35	5.70	5.30	06° 1	4.65	4.5		4.15		
		tan S	2950	1150	. 530	380	430	024	08 ⁴ 1	:	530		
	88	e'/e,	18.2	8.5	6.5	5.7	5.5	2.0	J. 4	!	O4.4		
•		tan 6	7600	3700	1400	009	904	150	024	!	200		
Bakelite BM-250 ^b	2 3	6,/6	37	8	15	7.2	5.3	5.0	1 1	!	į	:	5.0
(preformed and preheated)	•	tan 8	3000	3700	3900	2900	1250	550	!	:	!	!	320
Bake11te BT-48-306°	な	e,/e	8.2	7.15	6.5	5.9	₽•€	٠ ٥٠ ٦	1. 1	!	3.64	3.52	
		tan 6	1350	88	630	260	8	730	022	1	519	366	٠.
Bakelite BM-16981	23	e¹/e,	9. 7	6.1	5.4	5.1	6.4	4.8	1.7	1	9•4	4.5	
(not preformed or preheated)		tan 8	2300	1000	200	300	8	130	001		8	120	
Barelite BM-16981	%	e¹/e_	4.82	4.73	4.66	4.62	9.4	4.59	4.58	!	4.57	14.57	
(preformed and preheated)	∵	ten 8	140	120	100	20	52	0 <u>/</u>	8	1	8	89	
Bakelite BM-16981 ^d	Ċ,	e'/e,	5.05	14.87	% ••	4.79	4.72	to.67	4.62	:	. !	4.52	
(powder preheated)		ten 8	190	160	130	8	72	8	26	1	1 1 1	ଞ	
Laminated Fiberglas	お	61/6	14.2	9.8	7.2	5.9	5.3	5.0	8*4	4.34	01.4	4.37	
BK-174		ten 8	2500	5600	1600	88	94	340	260	240	230	360	
Catalin 200 base, white	55 *	E1/E	8.6	8.2	4.9	7.5	7.0	6.5	1	. !	4.89		
		tan 6	001	290	330	<u>0</u>	200	650	!	!	1080		
	*	e'/e,	53.5	34	1 7	17	12	9.5	!	!	5.8		
		tan 8	98000	20000	5200	1800	1000	1100	!	1	1910		
	25**	£1/€	6.9	6.7	9.9	6.5	6.3	5.8	!	5.1	4.61		
	• .	tan 6	130	170	260	330	380	084	1	878	986		÷

a. 46% wood flour, 8% misc. (Bakelite). b. 66% asbestos fiber (Bakelite). c. 100% (Bakelite). d. Mica-filled (Bakelite). e. 31.6% Bakelite's BV-17085, 68.4% Fiberglas (Owens Corning). f. Catalin.

^{*} Measured December, 1943. ** Same material measured after two years at room temperature and humidity.

I. Solids, B. Organic 3. Plastics (cont.)	tics (c	ont.)		Velue	1	σ 1.1. σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	:	-7		- '	,		
a. Phenol-formaldehyde				gon To	TOT COM	ere o	eridian	of for	; freque	ncy given	a In c/8	•	
(cont.)	o _E		1x10 ²	11103	1x10	1x10 ⁷	11106	12107	1x108	3x108	3x109	121010	2.5x10 ¹⁰
Cetalin 500 base,	* 3	e,/e°	2.6	4.6	8.8	8.1	7.3	6.3		8.4	4.72		
ye.llow		tan 8	580	350	00 1	550	760	1200	ļ	966	870		
	25**	e'/e _o	4.92	98.4	4.78	69°†	14.57	04.4	.c.	4.02	3.7	3.41	
		tan 8	99	100	150	230	330	09 1	580	620	520	360	
Catalin 500 base,	25	6,/6	20.0	15.2	12.6	10.8	9.6	4.8	:	5.79	4.77	£4.43	
e canderd		tan 8	5800	1500	1000	860	046	1200	:	1540	1250	1300	
Catalin 700 base	25*	e,/e	76	4	91	11	80	9	1	1	4.74		
(Frystal) ⁸			16500	9000	0014	2300	1600	1400	: : :	1 1	1530		
	*	e,/e	!	1	51	18.5	10.0	4.7	:	!	H.77		
		tan 8	!	1	13200	0099	3700	2400	- 1	!	1640		
	25**	e' /€°	58	1 72	큐	9.6	8.0	9.9	5.0	1.4	3.7		
			14000	9,000	3100	1900	1500	1400	950	710	200		
Durez 1601, natural	56	e'/e _o	5.09	46.4	4.80	4.68	7.60	4.55	4.51	1	84.4	74.4	
¢		ten 8	270	210	132	100	&	70	75	!	62	8	
Durite 500	54	€'/€°	5.10	5.03	4.95	98.4	4.78	4.72	4.72	1 2 1	4.71	۰۲۰	
, , ,		ten 8	130	104	88	78	88	102	115	-	126	128	
Formica IX	56	61/e°	5.23	5.15	96.4	4.78	7.60	4.32	†0° †	! ! !	3.57***	3.55+	
(field I to laminate)		tan S	530	165	170	230	340	064	570	1	****009	700 +	
Formica LF	56	e,/e,	6.50	5.70	5.30	5.00	4.75	4.35	3.95	! ! !	3.35***	• •	
(field 1 to laminate)		tan 8	1350	009	1,30	001	410	₁ +80	200	1	##*00 [†]		
Grade YN-25	S	e1/e°	3.73	3.65	3.61	3.61	3.59	3.47	1	3.24++	3.20	3.12	
(field II to laminate)		ten 8	121	132	200	207	187	187	!	183++	178	173	
	25	e1/e°	3.87	3.77	3.68	3.61	3.55	3.47	; ; ;			٠	
(field L to laminate)		tan 8	166	150	182	504	18 28	191					
Panelyte Grade 776	25	e'/e _o	4.25	4.18	4.10	3.95	3.87	3.73	3.52	3.40	3.22	3.12	3.05
		tan S	190	150	160	5 00	280	370	0 04	38	370	340	310
	· · ·	65% mics	c. 65% mica, 4% lubricants		(Durite).	d. 50%	paper 1	laminate	(Formica)	.0	40% cotton	fabric	
(Formica). f. 50% Nylon fabric (Formica).	(Form		8. Paper base (St. Regis)	38e (St.	Regis).						9.		
TIGGEORY DOCUMENTS IN THE	(I												

*Measured December, 1943. **Same material measured after two years at room temperature and humidity. ***Rod shock in coaxial line. +Rod stock in H₁₁ (TE₁₁) mode of circular guide. ++Freq. = 1 x 10⁹.

•
(cont.)
Organic
3, 3
Solid

3. Plastics (cont.)				Values	for tan	S are multiplied	tiplied	by 104;	frequen	frequency given	in c/s.		
s. Phenol-formaldehydes (cont.)	ToC.		11102	11103	12104	1x10 ⁵	1x10 ⁶	1x107	1x108		1	1x1010	2.5x10 ¹⁰
Moerta #2548	-13	e'/e	6.4	J. 4	4.5	†• †	2°4	0.4	3.4			3.13	
		tan 8	250	220	240	280	370	330	370			215	
	22	e,/e°	5.30	4.95	т. Н	99° †	4.51	4.20	3.85			3.25	3.21
		tan 6	992	330	560	270	360	027	550			1,10	380
	ଞ	e'/e°	9.2	6.3	5.5	5.3	5.1	6.4	į			3.21	
٠		tan 8	4100	1820	69	360	300	00 <u>1</u>	}			773	
Micarta #496 ^D	25	e'/e	8.6	7.0	6.3	9.6	5.5	4°8	4.38				
(field L to laminate)		ten 8	2200	11.00	630	500	0 2 1	630	710				
Micarta #496	25	e'/e _o	:	! ! !	!	!	1	;	!	3.95*	3.78*	3.62*	
(field II to laminate)		ten 8	!	!	1	1	!		į	510*	550*	\$210 *	
Phenolic paper laminate	52	e 1/e o	4.21	4.17	4.12	90°†	3.94	3.81	3.62				-
JE-1410 ^c		ten 5	146	100	115	162	222	295	339				
Resinox 10231	2 2	e'/e _o	11.4	9.3	9*1	6. 2	5.4	5.0	8.4	14.8**	7.4	9.4	
•		tan 8	1390	1410	1440	1180	200	001	290	310**	330	310	
Reginox 10900	25	e./e°	4.80	±9•±	4.4	4.37	५८.म	4.23	4.08	4.05**	4.03	4.02	
4		tan 8	275	270	230	180	135	110	83	93**	100	96	
Taylor Grade GGG	છ	€1/€0	7.25	80.9	4.67	41.4	7,00	3.9	3.9	3.9**	3.9	3.9	
(field laminate)		tan 8	1300	1600	1500	500	150	110	140	200**	250	290	
(field 1 laminate)	52	E1/E	3.95	3.91	3.85	3.8	3.75	3.68	3.64				
		tan 6	119	88	16	104	110	114	110				
Dilecto (Mecoboard)	22	e'/e _o	4.20	3.98	3.70	3.62	3.46	3.37	3.23	3.18	3.11	3.08	
		ten 8	004	344	318	304	263	223	216	215	220	529	
	8	$\epsilon^{1}/\epsilon_{o}$	11.90	8.40	6.23	5.60	5.32	45.4	1	3.35	!!!!	3.30	
		tan B	2310	1640	1020	2 84	570	970	!	099	1	024	

a. Cresylic acid-formaldehyde, 50% a-cellulose (Westinghouse). b. Cresylic acid-formaldehyde, 50% cotton drilling. (Westinghouse). c. 35% paper (Catalin). d. 53% filler (Monsanto). e. 35% mica, 18% filler (Monsanto). f. 40% rendom glass mat (Taylor).

g. 45% cresol-phenol formaldehyde, 15% tung oil, 15% nylon (Continental Diamond). *Samples turned from sheet stock. **Freq = 1 x109.

a. Phenol-formaldehyde	ى د		1x10 ²	values . lx10 ³	1x10 ⁴	1x10 ⁵	$ x_1 ^3$ $ x_1 ^4$ $ x_1 ^5$ $ x_1 ^6$ $ x_1 ^7$	1x107		1x10 ⁸ 3x10 ⁸ 3x10 ⁹		111010	
	۱۱ ار ا	e,/e	14.7	8.61	6.68	5.76	5.05	9.4	4.10	3.78	3.45	3.35	
XXX-P-26	}	tan 8	6420	2970	1380	840	720	705	690	990		0 81	
(Field 11 sheet)	8	e'/e,	:	1	!	:	1	; !	:	4. 36	!	3.72	
•		tan 6	!!!	;	1	1	!	:	1 1	950		022	
	120	e'/e	!	}	1	1	:	:	t 1 1	ŋ . 76		4.27	
		ten 8	1 1 1		1	1		1 1	1	86	t 1 !	8	
(Field L sheet)	25	e'/e,	4.29	12.4	41.4	10° †	3.89	3.73	3.56	3.35		ı	
		tan 8	137	119	137	180	250	340	330	O li 1			
	8	e'/e_	5.74	5.09	4.77	14.57	4.32	4.16					
		tan 8	1990	620	360	1 82	273	308		•			
	120	e'/e	7.42	5.38	· + 80	4.52	†€* †	15.4					
		tan S	0029	1910	630	380	290	352					
Wicarta #299 ^b	5 4	E1/E	5.36	5.29	5.20	5.10	5.01	4.92	% •			-	
(field L to laminate)		tan 8	270	130	115	122	138	150	170		1	 ()	
Micarta #299b	42	e,/e	;	1	!	;	1	!!!!	!	#±0-#	*460.	*******	
(field II to laminate)		tan S	1	!	!	!	1 1	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1	149*	100T	z)022	
Thirite #221XC	42	e1/e	6.70	5.70	5.30	4.30	4.55	4.30	4.15		3.65		
		tan 8	2000	820	520	024	1+30	004	390	1 2 1	350		,
	æ ₩	e'/e	13.8	7.0	5.8	5.5	4.9	4.5	4.3	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	3.72		
	•	tan o		3300	1200	550	091	024	02t	1	000	1	
Corfoam 114 ^d	35	e'/e,		1	1	1	1 1 1	!	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1	1 1 1	1.30	
		tan S	1	1 1	!	1 1	!!!	1	1 1 5	1 1 1	1	20	
Expanded plastic board	2. 12.	E 1/E	!!!	!	:	!	1 1	!	! ! !	!	1,21		
CP-73		tan 8	;	!	1	! ! !	!	!	!	1 1 1	& {		
Excanded phenolic board	35	e*/e	!!		1	!	1	!	! ! !	; 1 1	1.185		
•							1	1	! ! !	! ! !	2 2		

(Westinghouse). c. Thenol-furfuraldehyde (Durite). d. Expanded phenolic, den. 0.292 (Rezolin). e. Sponge Rubber Prod. *Stacked sheets in coaxial line. **Stacked sheets in H₁₁ (TE₁₁) mode of circular guide. a. 45% cresol-phenol formaldehyde, 15% tung oil, 40% a paper (Conti. Diamond).

(comt.)
Organic
m
Solids,
H

3. Plastics (cont.)

3. Plastics (cont.) b. Phenol-aniline-			Values	for tan	S are multiplied by 10 ⁴	ltiplied	by 10 ⁴ ;	frequer	frequency gaven	n in c/s		
formaldehyde Toc		1x10 ²	1x103	1x10	12105	1x106	1x107	1x108	3x108	3x109	1x10 ¹⁰	2.5x10 ¹⁰
Bakelite BM-262ª 25	ε'/ε _ο	4.85	o8•†	η . Τ	4.72	4.67	4.66	4.65	:	1	4.55	4.5
(preformed and preheated)	tan 8	86	88	75	8	. 55	55	57	:	1 2 1	105	89
Bakelite BM-262 ^a 26	ε¹/ε _ο	6,4	8,4	4.75	2.4	1.4	4.65	4.65	·;	4.58	4.45	
(not preformed or preheated)	tan 6	235	165	113	83	2	65	&	1 1	8	104	
₹ 8	e'/e	5.8	5.4	5.1	5.0	4.9	4.8	2.4	;	4.58	1	
,	tan 8	089	011	580	210	160	135	120	1	120	1 1	
Bakelite BM-1895	e'/e	4.80	4.72	η . 70	19.4	†9°†	19.4	4.58	4.55	4.53	£4.4	4.35
(preformed and preheated)	tan 8	87	11	&	65	52	52	&	98	102	100	130
Bakelite BM-1895 ^D 28	e'/e _o	5.0	6.4	4.75	4.65	4.55	4.5	4.5	i 1 2	न्र ग	Ţ.	
(not preformed or preheated)	tan 8	138	122	106	8	72	57	8	1 1	16	96	
48	e¹/e	5.8	5.3	5.0	8.4	4.65	9*4	6.4	1 9 1 1	9.4		
	tan S	047	024	310	225	175	140	125	!	132		
Durez 11363° -12	e,/e	4.68	4.59	4.52	84.4	24.4	4.39	;	- 1 1 1	4.32	4.31	
(preformed and preheated)	tan 8	2.6	ౙ	99	22	143	38	:	!!!	\$	747	
25	e,/e	4.76	4.70	19° t	9.4	4.55	4.50	84.4	!	4.45	ट्रम्•म	
	tan S	108	100	88	89	52	84	52	# 1 1 1.	69	92	
%	e,/e	5.26	5.03	4.37	47.4	4.63	4.55	;	!	04.4	4.38	
	tan 8	504	290	195	145	125	113	-	1 1	100	901	
Durez 11863 ^c 26	ε'/ε _ο	5.44	5.22	5.04	%• *	4.78	4.69	!	;	4.52	64.4	
(not preformed or proheated)	tan S	760	390	230	160	115	88	1 !	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	63	63	
Formica Grade MF-66 25	e'/e	4.53	4.50	t.43	4.38	4.31	क्ट• क	4.11	4.09	3.90	3.88	3.85
1.100.610a	tan 8	901	8	107	102	95	109	160	195	560	530	300
79	e'/e _o	46.4	4.75	4.66	4.59	4.51	† †**†	4.35	}	η**20	4.10	
	ı									,		

c. 43% mica, 5% misc.; discontinued, substitute 12810 (Durez). d. 40% a. 62% mica (Bakelite). b. 59.5% mica, 8.5% misc. (Bakelite). glass mat (Formica). e. 60% mica (Monsanto).

702 4°.04

37.6 40.4 8

4.05 ಹೆ

4.10 85

4.20

4.28 130

4.34 135

> 4.46 210

4.62 220

 ϵ'/ϵ_o tan 8

Resinox 7934⁶ 25 (preformed and preheated)

tan 8

178

130

110 4.13

105

110

I. Solids, B. Organic (Cont.)

*Stacked sheets in coarial line. ** Stacked sheets in Hil (TE11) mode of circular guide.

1.410 ² 1.110 ²	Solids. B. Organic 3. Plastics (Cont.)	Values	94	S are m	are multiplied		freque	frequency given			,	
6,59 6,31 6,18 6,01 5,85 5,53 5,10 4,13° 4,20 4,10 4,10 30,3 173 162 221 320 415 500 523* 520 505 8,43 6,95 6,37 6,04 5,71 510 41,90 41,40* 41,20* 41,00 2020 960 460 350 410 510 500 523* 520 500		14102	11103	1210#	11105	1410	12107	1108	3108 3108	32109	11010	2.5×1010
363 173 162 221 320 415 500 523* 520 505 8.43 6.94 6.37 6.04 5.71 5.36 4.00 4.40* 4.20 4.00 2020 960 460 350 410 510 560 620* 620 500 5.58 5.49 5.40 5.32 5.22 4.86** 5.22 140 7.1 64 93 160 4.86** 5.22** 4000 1400 280 95 65 110 4.98** 5.22** 4000 1400 280 95 65 110 4.98** 5.22** 6.13 6.07 5.97 5.81 5.82 5.8 4.98** 5.22** 4.000 1.25 105 85 108 145 200 4.98** 5.21** 1.25 1.26 1	e'/e,	6.50	6.31	6.18	6.01	5.85	5.53	5.10	4.37*	8.3	14,10	
8.43 6.95 6.37 6.04 5.77 5.36 4.39 4.40* 4.50 4.00 4.00 4.00 4.00 4.00 4.00 5.00 6.00 7.00 <t< td=""><td>tan 8</td><td>308</td><td>173</td><td>162</td><td>221</td><td>320</td><td>415</td><td>200</td><td>523*</td><td>520</td><td>505</td><td></td></t<>	tan 8	308	173	162	221	320	415	200	523*	520	505	
5.58 5.60 410 510 560 620 620 520 520 5.58 5.48 5.40 5.32 5.22 4.864* 5.22** 140 71 64 69 93 160 4.864* 5.22*** 6.18 5.9 5.8 5.8 5.8 4.86** 5.22*** 4000 1400 280 95 65 110 4.96** 5.32*** 4000 1400 280 95 65 110 4.96** 5.32*** 4000 1400 280 95 150 145 200 4.98** 4.78** 5.32*** 4100 125 150 145 200 4.98** 4.78** 5.12** 4115 200 2.02 175 170 2.55 4.98** 4.70** 4116 4.03 5.70 5.55	e'/e,	8.43	6.95	6.37	₹0°9	5.77	5.36	4.3	*O1;* 1	S. 3	00,4	
5.58 5.58 5.49 5.40 5.32 5.22 4.86** 5.22** 140 71 64 69 93 160 339** 5.28** 8.4 6.5 5.9 5.8 160 139** 660** 8.4 6.5 5.9 5.8 150 498** 5.32** 4,000 1400 280 95 65 110 498** 721** 6,13 6,07 5.97 5.91 5.72 5.55 4,98** 721** 6,15 6,07 6.00 5.91 145 200 4,89** 4,77 135 120 155 170 5.75 5.7 5.7 5.7 5.7 4,79 4,70 136 120 125 170 5.75 5.7 4,73 4,70 138 120 125 125 120 4,20 <td>ध्या ठ</td> <td>2020</td> <td>96</td> <td>091</td> <td>350</td> <td>110</td> <td>510</td> <td>260</td> <td>\$029</td> <td>620</td> <td>83</td> <td></td>	ध्या ठ	2020	96	091	350	110	510	260	\$ 029	620	83	
140 71 64 69 93 160 339** 660** 8.1 6.5 5.9 5.8 5.8 5.68** 5.32** 4000 1400 280 95 65 110 4.98** 5.32** 6.13 6.07 5.97 5.81 5.72 5.55 4.98** 5.32** 190 125 105 85 108 108 128** 4.75** 5.23** 113 6.05 6.00 5.93 5.82 5.70 5.55 5.5 4.89** 4.70 4.70 113 93 120 175 170 215 170 215 250 4.73 4.70 113 122 123 124 125 170 6.45 6.0 5.71 4.03 4.73 4.70 123 124	e'/e,	5.58	5.53	5.49	5.40	5.38	5.55		!	**98**	5.22**	
8.4 6.5 5.9 5.8 7.2 5.5 498** 7.23** 7.21** 130 125 105 5.9 5.8 5.7 5.5 4.80** 5.23** 5.15 5.05 5.09 5.93 5.8 5.70 5.55 4.80** 5.8 5.70 5.55 4.80** 5.8 4.70 15.0 4.70 4.75 4.73 4.70 4.90** 4.70 4.90** 4.70 4.90** 4.70 4.90** 4.70 4.90** 4.70	tan 8	140	17	₫	69	93	160	8 8	!	339**	**099	
4000 1400 280 95 65 110 498** 721** 6.13 6.07 5.97 5.81 5.72 5.55 4.89*** 4.89**	e*/e	8 •.⁴	6.5	5.9	5.8	5.8	5.8	:	:	5.68**	5.32##	
6.13 6.07 5.90 5.81 5.72 5.55 +.89++ 190 125 105 85 108 145 200 +.89++ +.89++ +.89++ 5.24+ 322++ 322++ 322++ 322++ 322++ 322++ 322++ 322++ 322++ 322++ 322		0004	1400	580	8	65	110	1	!	**86 [†] 1	721**	
125 105 85 108 145 200 322++ 6.05 5.93 5.82 5.70 5.55 5.5 4.83*** 4.75*** 5.12+ 6.05 5.93 5.82 5.70 5.55 5.5 4.70 93 120 155 170 215 260 360 155 170 215 260 360 150 6.45 6.0 5.73 4.73 360 122 150 240 410 640 850 985 1028 1100 1400 850 985 1028 1100 1400 860 850 985 14,60 1400 1250 14,00 1250 14,00 1250 14,00 1250 14,00 <	E1/E	6.13	20.9	5.97	5.90	5.81	5.72	5.55	t 1	!	4.80 ++	
6.05 6.00 5.93 5.82 5.70 5.55 5.5 4.83*** 4.75*** 5.12** 93 120 155 170 215 255 5.5 4.70 93 120 155 170 215 260 4.70 7.57 7.40 7.26 7.00 6.45 6.0 5.73 4.73 122 150 240 410 640 850 985 10.28 1100 8.7 2.40 410 640 850 985 10.28 1100 5.60 2.10 410 640 850 985 10.28 1100 5.60 2.10 410 7.9 7.5 7.0 5.0 5.04 5.00 6.50 6.50 6.50 5.70 5.20 5.04 4.53 4.23 210 150 270 440 660 820 859 820 760 210 150 270 440 660 5.20	ten 8	190	125	105	8	108	145	88	1	i 1 1	322++	
6.05 6.00 5.93 5.82 5.70 5.55 5.5 4,70 93 120 155 170 215 260 360 155 175 170 215 260 360 150 155 170 215 260 360 7.57 7.40 7.26 7.00 6.45 6.0 5.73 4.73 122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.0 5.04 560 210 140 650 820 820 1490 760 6.90 6.75 6.50 6.20 5.04 4.53 4.23 210 150 270 440 660 820 859 820 760 150 270 440 660 820 859 820 760 150 </td <td>e'/e</td> <td>!!!</td> <td>1 1 1</td> <td>!</td> <td>1</td> <td>!</td> <td>!</td> <td>1 1</td> <td>4.83***</td> <td>4.75***</td> <td>5.12+</td> <td>t+0L*</td>	e'/e	!!!	1 1 1	!	1	!	!	1 1	4.83***	4.75***	5.12+	t+0L*
6.05 6.00 5.93 5.82 5.70 5.55 5.5 4.70 93 120 155 170 215 260 360 155 170 215 260 360 7.57 7.40 7.26 7.00 6.45 6 0 5.73 4.53 4.60 122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 5.5 5.04 6.90 6.75 6.50 6.20 5.04 4.53 4.23 210 190 270 440 660 820 820 820 169 210 190 270 440 660 820 820 820 160 210	tan S	;	1 1	! ! !	!	1 1	! ! !	1 1	150***	5 60***	380+	++00 1
93 120 155 170 215 260 360 4,95 4,73 360 7.57 7.40 7.26 7.00 6,45 6 0 5.73 4,93 4,60 122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 5.5 5.04 6,90 6,70 6,20 5,70 5.5 5.04 210 140 660 820 850 820 76 210 150 270 440 660 820 859 820 76 120 270 440 660 820 859 820 76 120 270 440 66	€'/€	6.15	6.05	6. 00	5.93	5.82	5.70	5.55	5.5	!!!!	02.4	79.4
7.57 7.40 7.26 7.00 6.45 6.0 5.73 4.73 122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 5.5 5.04 6,90 6,75 6,20 5.70 5.20 5.04 4,53 4,23 210 190 270 440 660 820 859 820 760 210 190 270 440 660 820 859 820 760 210 190 270 440 660 820 859 820 760 210 190 270 440 660 820 859 820 760 210 190 190 190 190 190 190 190 190 190 210 190 190 190 190 190 <t< td=""><td></td><td>135</td><td>93</td><td>120</td><td>155</td><td>155</td><td>170</td><td>215</td><td>560</td><td>-</td><td>360</td><td>560</td></t<>		135	93	120	155	155	170	215	560	-	360	560
7.57 7.40 7.26 7.00 6.45 6 0 5.73 4.93 4.60 122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 5.5 5.04 6.90 6.75 6.50 6.20 5.70 5.20 4.53 4.23 210 150 270 440 660 820 859 820 760	e¹/e,	!	:	•	!	1 1 1	1	1	4.3	4.73	1	9.4
7.57 7.40 7.26 7.00 6.45 6.0 5.73 4.33 4.60 122 150 240 410 640 850 985 1028 1100 8.7 8.4 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 1250 1490 6.90 6.75 6.50 6.20 5.70 5.20 5.04 4.53 4.23 210 150 270 440 660 820 859 820 760 3.75 3.75			1 2 1	!!!	1 1	!	į	! ! !	210	250	1	560
122 150 240 410 640 850 985 1028 1100 8.7 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 1250 1490 6,90 6,75 6,50 6,20 5.70 5.20 4,23 4,23 210 150 270 440 660 820 859 820 760 3,75 3,75 1320	e'/e,	7.73	7.57	o₁• 'L	7.26	7.00	6,45	0 9	5.73	4.93	9.4	
8.7 8.4 8.4 7.9 7.5 7.0 5.5 5.04 560 210 140 220 410 700 1250 1490 6.90 6.75 6.50 6.20 5.70 5.20 5.04 4.53 4.23 210 150 270 440 660 820 859 820 760 3.75 3.75 3.20	ten 8	190	122	150	240	01 †	049	850	985	1028	2700	
560 210 140 220 410 700 1250 1490 6.90 6.75 6.50 6.20 5.70 5.20 5.04 4.53 4.23 210 150 270 440 660 820 859 820 760 3.75	e¹/e,	98.6	8.7	8.4	4.8	7.9	7.5	7.0	1	5.5	5.04	
6,90 6,75 6,50 6,20 5,70 5,20 5,04 4,53 4,23 210 150 270 440 660 820 859 820 760	tan S	1800	260	210	140	220	71 0	200	1 1 1	1250	1490	
210 150 270 440 660 820 859 820 760	e1/e	7.05	6.90	6.75	6.50	6.20	5.70	5.20	5.04	4.53	4.23	
3.75	tan S	014	210	190	270	01/1	099	820	859	820	160	
320	e1/e	1	1	! ! !	1	1	1	1	1	1 1	3.75	3.74
	ten ô	\$ \$ \$	1			1 1 1	1 4 1 3	1	1 2 1	!	320	300

(Westinghouse). e. Fibergias (St. Regis). f. α-cellulose (Libbey-Owens-Ford). g. 40% cellulose (Monsanto). * Freq. = 1 x 10⁹. ** Sample nonhomogenous; stacked layers. ***In coaxial lines. +In H₁₁(TE₁₁) mode circular guide. ++In H₀₁ (TE₀₁) a. 40% wood flour, 18% plasticizer (Am. Cyanamid). b. 60% melamine, formaldehyde and aniline polymer with wood flour filler (Am. Cyanamid). c. 56.5% An. Cyanamid's Melmac 7278, 43.5% Owens-Corning's Glass "E" (Hood Rubber). d. 65-70% Fiberglas

mode rectangular guide.

I. Solids. B. Organic 3. Plastics (cont.) Values for tan 5 are multiplied by 10 ; frequency given in c/s.

32108	5.1 4.57 4.47	555	5.1 4.79	530 694	5.5h	0100	09.4 88.4	438 527		3,62* 3,52	320 342* 336 318		1	1	3.0 2.84 2.3	117	46.2	1	1	!	3.06* 3.02	140* 120		29	•		3.28 3.24 3.24	210 220 290 400 310	3 30	i i
70121										4.15	273	!	3.24	1 1178	3.05	205	3.7	1150	3.05	280	3.24	214	2.61	8			3.30	210	3.44	•
90171	5.65	270	0.9	310	6.8	30	5.75	280		4.26	196		3.33	257	3.14	218	4.4	1720	3.2	380	3.36	232	2,64	114			3.42	230	3.58	
1210	5.9	195	6.2	220	7.1	350	6.00	250		04.4	140		3.45	254	3.24	221	6,3	2030	3.7	200	3.49	275	2.72	165			3.53	230	3.77	-
40121	6.05	8	4.9	220	7.4	02 1 7	6.15	240		4.50	127		3.60	233	3.35	208	0.6	1580	0.4	9	3.64	262	2.80	574 1			3.67	200	3.00	,,,,
11103	6.2	240	6.7	280	7.8	8	6.35	260		4.58	189		3.75	193	3.50	186	11.2	1400	2° t	O † (9	3.76	180	2.94	200			3.77	150	30.5	,,,,
1x10 ²							€9.9	350		14.72	348		3.88	144	3.60			_	4.5	650	3°8	115	3.25	1070			۳ 8	93	3,08	: ``
	e'/e°	ten 8	6' /e	ten 6	e'/e	ten 8	e'/e,	tan S		e1/e	tan 8		e'/e _o	tan 8	e'/e	tan 8	ε,/ε ^ο	ten 8.	e'/e	tan 8	e¹/eº	tan 8	e'/e	tan 5		•	e'/و	tan 8	€¹/€	c -
o _E	22		42		&		1 72			25			25		52		ಹೆ		25		25		25				25		į	£
e. Urea-formaldehyde	Beatle Resin ⁸	•	Plaskon Ures, natural				Plaskon Urea, brown		f. Benzoguanamine- formaldehyde	Benzoguanamine Resin		g. Polyamide Resins	Nylon 66 ^d	4	Nylon 610"			Ч	Nylon 610°-90% humidity	•	Nylon FM 10001 ^d		Restin #90S		h. Cellulose Derivatives	1) Acetates	$1L-1^{I}$			

a. Cellulose (Am. Cyanamid). b. α-cellulose (Libbey-Owens-Ford). c. 2% α paper (Am. Cyanamid). d. Heramethylens-adipamide (Dupomt). e. Code RC-2072 (General Mills). f. 55.4% acetyl (Hercules). * Freq. = 1×10^9 .

	h. Cellulose Derivatives (cont.)	(cont.									•				
	1) Acetates (cont.)	J _O H		2017I	11103	1104	12105	12106		12108	3x108	31109	121010	2.5x1010	
	Lumarith XFA-Ht ^B	£2	e'/e _o	19.4	4.51	96.4	4.13	3.79		3.37	3.80	3.13	3.08		
	•		tan 8	152	240	340	128	98 1		380	365*	3,50	325		
	Fibestos 2050IVA C-1686 ^D	56	د./د°	4.75	4.53	4.30	3.82	3.60		3.35	i I)))		
	•		ten 8	1 ₈ 9	365	380	<u>ह</u>	₹30		350					
	Tenite I 0084 H ₂	56	د،/د°	¥.85	4.55	O†• †	4.20	3.96		3.47	1 1	3.16		3.08	
	¢			102	173	586	370	1430		110		310	!	350	
	Tenite I 008 H	56	e'/e ₀	4-55	84.4	4.33	41.4	3.90		3.40		3.25	3.16	3.11	
	c		ten 8	&	175	570	345	393		380	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	310	300	300	
	Tenite I 008A M	56	e'/e _o	4.97	78. 4	02.4	14.52	4.25		3.57	1	3.24			
			ten 8	123	175	285	00 1	6		550	! !	380			
	Tenite I 0084 Ma	56	6./6	18.4	8.4	9.4	04.4	4.18		3.5	• • • •	3.26	3.09		
•		,		7.7	170	290	380	\$94		550		370	330		
	Tenite I 0084 S	56	د ر/د ْ	5.14	2.06	4.90	†9° †	4.30	3.96	3.65	!	3.23			
	: :	. `		001	160	280	10°5	530		580		0Z 1			
	renite 1 00cm s _h	56	د./د	5.34	5.28	5.15	4. 90	4.57		3.75	!	3.20		3.1	
	months it over it d	ì	ten o	85	135	230	370	540		700	!	08 4		380	
	ופווזרפ זו כייאי הי	0	e'/e _o	3.54	3.50	₹ 4.€	3.38	3.28		3.05	!!!	2.80			
,	nemitte IT ONER IT d	ý	ten 6	7.8	107	158	174	178		190		267			
	יש אליים דד פיזויים ד	C.	e'/e	3.54	3.48	3.12	3.37	3.30		3.08	3.8	2.91	28.8		
	mentte IT ocen und	ţ	ten 8	Ę,	7	156	175	178		170	179	280	298		
	da a como	N	¢./e°	3.60	3.56	3.50	3.40	3•30		3.10	 	2.87	;		
	ment++ IT ONER and	Ş	ten 8	සි	117	170	192	200		200	!	310	\$ H & P & P & P & P & P & P & P & P & P &		
	CN HOS II DOINGT	/2	د./د °	3.67	3.64	3.55	3.45	3.40		3.15	;	2.92	2.83		
	Tentte IT ONES & d	ţ	ten s	g	115	178	213	820		250	1	370	360		
	So was it same	2	د ا/د°	3.80	3.75	3.66	3.58	3.48		3.20.	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	2.98	-		
	Tentte TT OOR & d	Ċ	ten s	လ္ထ	ક્ટ	155	₹ 02	225		300	1	994			
	ים אלון פון פון פון	, V	د،/د°	3.83	3.80	3.74	3.66	3.58		3.30	1	3.08	:	8	
			ten 8	&	8	150	500	235		320	† 1 1 1	520	1 1 1	360	

Values for tan 5 are multiplied by 10 ; frequency given in c/s.

I. Solids, B. Organic, 3. Plastics (cont.)

a. 28% plast. (Celanese). b. 26% plasticizer (Monsanto). c. 23-31% plasticizer, pigments, dyes (Tenn. Eastman). d. 5-15% plasticizer pigments, dyes (Tenn. Eastman).

^{*} Freq. = 1 x 109.

	2.5x10 ¹⁰				2.65 300		
	2.87 308	3.32		2.70	2.67 256 2.66 402	3.90 45 474 61	(0
	3x10 ⁹ 2.88 289	3.74 1650 4.0	3.35	2.74	2.74 196 2.79 214	3.90 3.79 3.79	(Tormica
	1x10 ⁹ 2.95 247			2.77		3.92 40 3.81 37	4
	frequer 1x10 ⁸ 3.08 192	5.2 1030 5.2 1030	1000	2.8	2.80 2.80 200	3.73 3.94 3.82 3.82	•
	by 10 ⁴ ; 1 <u>x10</u> 7 3.18 164	6.1 930 6.1	4.9 1020	2.96	2.87 158 2.80 140	3.73 1.5 3.95 3.82 2.82 3.82	13.3
	1x10 ⁶ 1x10 ⁶ 3.23 175	6.6 640 6.2 640	5.7	3.01	2.92 115 2.80 90	3.73 12 3.99 97 3.82 46	10.5
	Talues for tan 3 are multiplied by 10^4 ; frequency given in c/s $\frac{ \mathbf{x} 0^3}{ \mathbf{x} 0^4}$ $\frac{ \mathbf{x} 0^5}{ \mathbf{x} 0^5}$ $\frac{ \mathbf{x} 0^6}{ \mathbf{x} 0^7}$ $\frac{ \mathbf{x} 0^8}{ \mathbf{x} 0^9}$ $\frac{ \mathbf{x} 0^9}{ \mathbf{x} 0^9}$	7.0 400 6.3 600	6.1	3.02	2.99 67 2.85 66	3.73 14.09 530 3.85 130	01
	for tan 1x10 ⁴ 3.41 157	7.5 450 6.7 1500	6.4	3.05	3.02	3.73 15 4.37 570 3.87 96	10.5
	Values 1x103 3.48 101	8.4 1000 7.5 7000	6.8	3.09	3.06 148 3.00	3.73 16 4.72 575 3.91 110	11.5
	3.52 60	10.8	7.6	3.11	3.10 48 3.00 78	3.73 17 5.18 790 3.99 210 3.79	13
(cont.)	e'/60 tan 8	e'/e° tan & e'/e° tan &	e'/ε, tan δ	e'/e, tan 3	e^{i}/ϵ_{o} tan δ e^{i}/ϵ_{o}	<pre>e'/e ten 5 e'/e ten 8 e'/e ten 8 e'/e ten 6</pre>	ten 8
3. Plastics (cont.)	10°C 25	27	22	25	₹ ₹	25 25 25	:
I. Solids, B. Organic 3. P.	h. Cellulose Derivatives (cont.) 2) Propiomate Forticela	3) Witrate Pyralin	4) Methyl Cellulose Methocel ^C	5) Ethyl Cellulose Ethocel IT5	Lu n arith #22361 ^d	Formica Gf ⁰ (field I laminate) (field II laminate) Formica Gf ⁰ (field II laminate) (field II laminate)	

a. 8% plast. (Celanese). b. 25% camphor (DuPont). c. Dow. d. 13% plast. (Celanese). e. Fiberglas laminate (Formica).

Values for tan 8 are multiplied by 10^4 ; frequency given in $\mathrm{c/s}$.
I. Solids, B. Organic 3. Plastics (cont.)

1. Silicone Resins	•		c			ď	V	1	ď	σ	C	ç
(cont.)	EI EI		1x10 ²	1210	110	भेम	110	1110	110	1x10	310	1410-1
nc 996 cured 16 hrs.	25	e*/e,	3.08	40∙€	3.02	3.01	2.99	2.98	5.96			
at 150°c ^a		tan 6	83	42	65	52	2 4	38	31			
DC 996 cured 16 hrs.	25	e'/e	2.90	2.9	2.93	2.90	2,90	8.9	2.90			
at 250°C ^a		tan 8	† [15	1.6.5	17.5	1.8	17	16.5			
DC 2101 ^b	, †2	e¹/e	2.90	2.90	2.90	2.30	2.90	2.9	2.90			
(discontinued)		tan &	2	26	64	94	45	145	₹			
Polyglas S ^c	‡7,	e'/e	3.60	3.59	3.58	3.57	3.57	3.56	!	!	3.55	3.53
		tan 8	11	11	75	13	15	19	1	!	9	91
	&	e'/e,	3.50	3.59	3.58	3.57	3.57	3.56	1	:	3.55	3.51
		tan 8	52	17	Ħ	10	97	7,7	1 1 1	!	94	64
Molding Compound XM-3	25	e'/e,	4.03	00°†	3.99	3.98	3.95	3.93	3.92	!	3.85	3.85
		tan 8	51	52	ß	Ĺτι	38	ζ 1	50		29	1 6
Dilecto (Silicone glass	25	e'/e,	3.83	3.82	3.81	3.80	3.8	3.79	3.79			
laminate) CB-261S (field L		tan 6	12.8	13	13	12.3	12.9	14.8	23.5			
sheet)	8	e1/e	3.74	3.73	3.71	3.69	3.63	3.56		•		,
		tan 8	เร	8	8.5	23	39	56				
	500	e'/e,	3.50	3.62	3.44	3.42	3.40	3.35				
		tan 8	339	74.7	32.6	22.7	31.4	30				٠.
(field H sheet)	25	£1/6	16.4	8 ⁺ . ⁴	4.43	3.95	3.92	3.87	3.87	3. 8.	3.79	3.76
		tan 8	580	560	O [†] I [†] I	185	55	59	23	24	57	78
	220	e'/e	4.68	4.26	4.18	4.18	1	1	1	; ; ;	1	3.87**
		tan S	1620	526	300	195	; ; ;	2 1 2	1 1	1	1 1 1	15**
	25*	e1/e	4.05	3.93	3.90	3.85						
		ten ô	104	&	Z 1	31		٠				

c. 16% DC 2101, 84% Corning's 790 glass powder (Lab. Ins. Res.). d. 35% methyl and phenyl polysilicone resin, 45% glass fibers, a. Methyl, phenyl, and methyl phenyl polysiloxane resin (Dow Corning). b. Cross-linked organo-siloxane polymer (Dow Corning). 19% silica filler (Dow Corning). e. 50% DC-2103, 50% staple fibre glass base (Cont. Diamond). *After temperature run. ** 200° C.

I. Solids B. (rganic 3. Plastics (cont.) Values for tan 5 are multiplied by 10; frequency given in c/s.

		!								,	•			
•••	1. Silicone Regine	o _L		12102	14103	1x10 ⁴	1105	1210	12107	32108	11109	32109	121010	2.521010
	Dilecto (silicone glass	25		3.56	3.56	3.56	3.55	3.54	3.54	3.54				
	lamina :e) GB 1125 ^A			13.5	12.9	12.9	11.11	8.5	11.4	18.6				
	(field L sheet)	8	e'/e,	3.41	3.39	3.38	3.38	3.38	3.38					
				₹ . 92	3.91	14.9	16.1	11	8.6					
		500		3.18	3.18	3.18	3.17	3.15	3.10					
			tan S	236	£ 1	83	195	21	15.4					
	(field H sheet)	25		6.55	5.72	ηό ° η	3.96	3.8	3.82	3.8	3.78	3.76	3.70	
	•		ten 8	1250	910	1080	916	128	37	8	39	ζ,	87	
		215		10,93	8.60	6.65	26.4		1	!	}	!	3.78	
				2000	2080	1800	1410	! ! !		1 1 1	;	1 1	&	
		25*		5.71	5.15	154	3.98							
				₩ <u>5</u> 9	830 830	046	049							
. [7	DC 2103 Laminate (XL-48) ^b 25	25		3.94	3.92	3.3	3.30	3.8	3.30	3.38	;	3.88**	3.89**	
			tan 5	18	16	15	1 1	15	56	37	\$ 1 1	**19	**66	
•	Taylor Grade GSC ^C	25	€1/€	5.07	41.4	4.11	₹0° †	4.03	10.4	! ! !	3.91	3.90	3.85	
	(field laminate)		tan 8	66	25	83	111	50	15	1	20	39	04	
	(field I laminate)	25	e'/e,	3.78	3.77	3.77	3.77	3.77	3.74	3.74				•
			tan 8	13.4	12.5	11	9.5	9.3	11.9	18				
-	Taylor Grade GSS ^d	25	€1/€	4.10	06.4	3.94	3.94	なった	3.94	3.94	3.32	3.32	3.75	
	(field II laminate)		tan S	160	150	100	34	21	8	30	71	55	63	
	(field L laminate)	25	e'/e,	3.74	3.74	3.74	3.74	3.74	3.74	3.74				
			tan 8	15	4.	13	12	13	15	83				
,= ,	DC 2104 Leminate (XL-269) 25	6 25	€1/€	41.4	4.14	4.13	4.13	4.13	4.11	4.10	!	**LO**	t,05**	
•	1. Polyvinyl Resins		tan 8	32	59	56	8	55	53	34		71**	83**	
	1) Polyethylene													
v==#	Polyethylene DE-3 $401^{ m L}$	25	e*/e,	2.25	2.25	2,25	2,26	2.26	2,26	:	l ! !	2.26	2,25	
			tan S	2 V	8 V	α V	۵ ۷	رر ۷	থ V	1	!	3.1	3.6	
****	Polythene A-3305 ⁸	57	e'/e,	2.25	2.25	2.25	2.25	2.25	2.25	! ! !	:	2.25	2,25	2°5†
	(Now raplaced by		tan 8	2	۳ ۷	۳ ۷	۸ 5	.≠ V	8	:	1	m	_	2.9
	Ale thon)	&	e1/e	2.25	2.25	2.25	2.25	2.25	2,25	!!!	!	2.25	2.20	
			tan 8	^ ?	ر ۷	^	< 5	.≠ ∨	۲ ۲	!	!	7.2	8.5	
a. 50%	a. 50% DC-2103, 50% continuous-filament glass	ilamen	t glass	ã,	rt. Diamo	nd). b.	45% methyl and		phenyl p	olystlox	phenyl polysilozone resin, 55%		ECC-261 Fiberglas	lberglas

e. 37% methyl and phenyl polysiloxane resin, 67% ECC-181 fiberglas (Dow-Corning). f. 0.1% antioxidant (Bakelite). g. 100% polysihylene (Durent).

Measured after temperature run. **field II laminate, at other frequencies field L sheet.

T

I. Sclids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.)

	1) Polyethylene				Toluga	for ten	ton ten & one multifulad by 10.	1.5 27 1 4 20	μ 10 γα		fracilency piven in cla	a/0 a+		
	(cont.)			•	D	103 -						· · · · · · · · · · · · · · · · · · ·	•	4
	Polyethylene a	O _L		1×10 ²	1x103	1210	1110	12100	1300	1x10°	3x100	3x109	1x10 ¹⁰	2.5x1010
	25°C	23	e'/e,	2.25	2.25	2.25	2.25	2.25	2.25	2.25	1	2.25	2.24	
			tan 8	ณ V	α V	ณ V	ผ V	ci V	ر ا ا	a V	:	5.8	9•9	
	milled 30', 125°c	23	e'/e _o	2,26	2.26	2.26	2.26	2.26	2.26	2,26	2.26	2.25	2.25	
			ten 8	^	ιν	9	2	æ	6	10	9.01	11.7	11.9	
	milled 30', 190°c	-12	e'/e _o	2.38	2.37	2.36	2.35	2.35	2.34	2.33	# 	2.32	2.30	
			tan 8	5₹	ผ	19	18	21	28	39	1 1	36	22	
		23	€1/€	2,38	2.37	2.36	2.36	2.35	2.34	2.33	2.33	2.32	2.31	
			tem 6	28	28	52	27	28	30	3	ינל	20	∄	
	2) Polytsobutylene	•												
	Poly1 godutylene	25	e'/e	2.23	2.23	2.23	2.23	2.23	2.23	2,23	1	2.23		
	Run 5047-2		ten 8	4	н	~	رد ۷	г т	Н	m	1	1.4		2
	Copolene B	25	e¹/e	ಣ. ಚ	د. د.	د. د.	8.3	8°.3	8.3	6. 0	\$ \$ 1	2.3		
			tan e	91	တ	. #	н	ч	7	41	1	Ħ		
	3) Polyvinyl chloride-	_												
	Vinylite QYNA	50	e¹/e	3.18	3.10	3.02	2.96	2.88	2.87	2.85	1 1 0	2.84		
			tan S	130	185	225	210	160	11.5	묪	 	55		
		24	e'/e,	3.60	3.52	3•₺1	3.28	3.14	3.02	2,32	1	2.81		
			tan 8	100	991	240	261	228	162	110	1	7.1		
	•	92	€1/€	3.92	3.83	3.68	3.3	3.0	2.87	2.8	8.8			
			tan 6	180	220	320	001	350	270	190	175			
		96	e'/e,	9. 9	5.30	01.4	3.7	3.3	& 0	2.7	2.7	: : :	5*6	
			tan 8	1500	1400	1200	986	047	500	320	280	1 1	130	
		17.0	۾1/د م	6.6	8.6	6.8	5.6	-						
			tan 8	1030	1330	1780	1900							-
	Vinylite VG-5544	25	e'/e,	7.72	7.20	OH*9	5.25	4.13	3.45	3.05	2,99	2.94	ر. وي	۶ <mark>•</mark> 8
			tan 8	570	049	1060	1500	1550	1200	650	091	185	159	150
	Vinylite W5901, black	25	$\epsilon^{1}/\epsilon_{0}$	6.5	5.5	9.4	3.9	3°F	3.1	3.0	2.94	2.88	2,83	
			tan 6	1020	1180	11.90	1000	740	500	580	200	106	105	*1
a. Be	a. Bakelite. b. 100% Esso Lab.).		, 61% polyteobu		tvlene B-100.		30% Marbon B (Am. Phenolic)	Am Phar)0]1c)	d. 100%		polyvinyl chloride (Bakelite).	ide (Bake	11te).

a. Bakelite. b. 100% Esso Lab.). c. 61% polyisobutylene B-100, 39% Marbon B (Am. Phenolic). d. 100% polyvinyl chloride (Bakelite). o. 40% polyvinyl chloride-acetate, 40% plast., 14% misc. (Bakelite). f. 62.5% polyvinyl chloride-acetate, 29% plast., 8.5% misc.

(Bakelite).

I. Solids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for tan 8 are multiplied by 104: frequency given in c/s

2) Doluminal onlined						2	D 100	ממדי ביז לה	Tea ny T	bear : o	uency gi	out care mutufulled by to ; Irequency given in c/s	19
OT TOTAL CHART (C			ć	(,							
(comt.)	S I		1110	1110		1110	_		12108	3108		1x1010	2,541010
Vinylite VG-5904, black 25	25	e'/e ₀	8.1	7.5		4.5			3.3	3.1		2.83	2476
4		ten 8	550	710		1390			029	200		320	
Vinylite VU-1900, clear	5 †	ε'/ε _ο	6.55	5.65		3.90			2.80			2,62	2,62
		tan 8	1000	1150		1180			310	į		104	110
	42	e,/e°	10.3	8.15		6.5			3.4	1		9.60	
e		tan 8	7300	1250		800			1550	:		351	
Vinylite VYHH	22	€¹/€°	3,20	3.12		3.00			2.83			}	
		tan 8	100	130		150			8	1	92		
	147	e'/e _o	3.56	3.48		3.27			0, 0,	i 1 1	2.79		
ч		tan 8	110	342		227			411	1	: &		
Vinylite VYNS	S	e,/e°	3.10	3.08		2.95			2.8	i	2.74		
•		ten 8	115	140		170			&	. !	63		-
Vinylite VYNW	8	ε,/ε°	3.20	3.15	3.05	2.96	2.9	2.84	8.0	1	2.74		
% 7		tan S	135	165		190			&	1	59		
Geon 2046	83	e'/e _o	5.95	01.9		4.13			3.00	2.97	2.89	2.83	
		tan S	68 80	1100		1200			300	211	911	116	
	&	e¹/eº	9.1	8.8		7.6			0.4	-	3.06	2,9	
b		ten 8	250	300		089			1500		1 84	328	
Geon 20365	25	e'/e	3.67	3.65		3.52			3.34				
đ s		tan 8	89	8		245			120				:
Geon 80384	23	e'/e _o	3,43	3.34		3.14			3.95				
		ten 8	120	184		217			101				

polyvinyl chloride, 30% dioctyl phosphate, 6% stabilizer, 5% fille: (Goodrich). g. 71% polyvinyl chloride, 10.5% filler, 5% plasticizer, 32% Flexol D.O.P., 3.5% misc. (Bakelite). c. Polymer of 87% vinyl chloride and 13% vinyl acetate (Bakelite). d. Polymer of 91% a. 54% polyvinyl chloride-acetate, 41% plast., 5% misc. (Bakelite). b. 64.5% polymer of 95% vinyl chloride and 5% vinyl acetate, vinyl chloride and 9% vinyl acetate (Bakelite). e. Polymer of 95% vinyl chloride and 5% vinyl acetate (Bakelite). f. 59% 8.5% strillzer (Goodrich). h. 87.8% polyvinyl chloride, 10.5% stabilizer (Goodrich).

I. Solids B. Organic 3. Flastics j. Polyvinyl Resins (cont.) Values for tan 5 are multiplied by 10 ; frequency given in c/s.

1									,	,			•	
	3) Polylvinyl			1	,	-	ı	(c			Ç	
	Chloride (cont.)	o E I		1×102	12103	1x104	1x10	1x10°		1x10°	3x100	3210	1x10 ^{±0}	
	Koroseal 5CS-243a	27	e'/e	6.1	5.65	5.00	4.15	3.60		2 \$\cdot			2,62	
			tan 8	262	1000	1300	1250	930		300			120	
	Lucoflex ^b	25	£'/€		 	!	!	:	!	2.75				
			tan 8	;		-	;	!		170				
	Folywinyl chloride 1006°	25	e1/e	6.1	1	4.55	!	3.3						
			tan S	760	!	1100	-	760						
	Polywinyl chloride 1018 ^d	25	e¹/e	6.2	!	4.95	į	3.15						
			tan S	630	i	950	1	88						
	Polyvinyl chloride 1216 25	25	£1/€	6.1	1	†• †		3.2						
			tan 8	1170		1110	!	1450						
	Polyvinyl chloride 1406 25	25	e¹/e	6.05		4.5		3.6						
			tan 8	870	1 1	046	\$ } !	08 1 7						
	fre Compound	. 25	e¹/e	3.31	3.22	3.10	2.98	2.85						
	ur.3008		ten 8	150	210	250	220	155						
	Ultron Wire Compound	22	61/6	6.14	1	4.65	1	3.3 .3						
	UL1004 ⁿ		tan 8	810	1	1210	i	047						
	Ultron Wire Compound	25	e1/60	2.9		7.4	1	3.5						
	UL2 4001.K		tan S	1100	!	1210		200					٠	
	Polywinyl chloride	22	e1/e	5.45	177.4	4.17	3.75	3.52	3.25	3.00				
	14-17-17		tan 8	815	930	88	740	550	425	415				
	Polywinyl chloride	. 25	6' /e	₹6•€	5.20	4.51	3.90	3.44	3.37	3.0⁴				
	W-175 th		tan 8	0 1 8	960	96	865	580	430	300				
	Polywinyl chloride	22	e'/e _o	6.21	5.52	07.4	3.96	3.53	3.28	3.00				
	W-176P		tan 8	730	046	1070	096	720	520	500				

31.2% plasticizers (Monsento). n. 65% Geon 101, 35% Paraplex G-25 (Rohm and Haas). n. 65% Geon 101, 35% Paraplex G-50 (Rohm and Haass). a. 63.7% polywinyl chloride, 33.1% di-2-ethylhexylphthalate, lead silicate (Goodrich). b. Unplasticized polywinyl chloride (Lucoflex (Monnanto). g. 100% polymer (Mcmemanto). h. 64.7% polymer, 2% filler, 32.5% plasticizers (Monsanto). k. 60.1% polymer, 7.8% fillers, (Monsanto). c. 57.5% polymer, 10.4% fillers, 31.6% plasticizers (Monsanto). f. 59.4% polymer, 10.7% fillers, 29.7% plasticizers Plastic). c. 57.5% polymer, 12.6% fillers, 28.7% plasticizers (Monsanto). d. 52.4% polymer, 15.1% fillers, 31.4% plasticizers P. 65% Geon, 35% Paraplex G-60 (Rohm and Haas).

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Plastice118		e¹/e,	1.04	1.04	1.04	1.04	1.04	1	1.04	1.04#	1.04	₽.	
		tan S	23	11	< 15.	< 15	10	!	91	18*	55	ያ	
Ensolite M22240 ^b	25	e'/e,	1.51	1.36	1.29	1.24	1.16						
		ten 8	3200	610	330	340	1 50						
Fnsolite M22239 ^b	25	e¹/e¸	1.48	1.10	1.31	1.25	1.20						
		tan S	2850	770	280	250	310						
Ensolite 3036 ^b	25	e¹/e	1.30	1.24	1.19	1.17	1.16						
(field I plane of sample)	•	tan S	368	263	187	137	111						
(field plane of sample) 25 e'/e	.e) 25	e¹/e,	. !	:	1	1	!	1	i	1.14*	1,12	1,10	
		tan 8	į	1	1 1	!			!	*18	8	ಜ	
4) Polyvinylidene and													
Vinyl chloride											i		
Saran B-115°	23	e,/e	4.88	4.65	4.17	3.8	3.18	2.97	ત. જ	-	2.71	2.70	
		tan 8	150	630	885	8 5.5	570	310	180		72	Ľ,	
	ಹ	e'/e	5.13	4 6° τ	4.85	4.71	아 * 1	3.75	3.2		5.76		
		tan 8	800	210	130	3≥0	780	1300	8	1	242		
5) Polychlorotrifluoro-	ė.												
ethylene			- Children and Children										;
Kel-Fa	56	e1/e	2.72	2.63	2,53	2,16	2.43	2.35	1	2.30	2.30	2.29	2.29
		ten 8	210	270	230	135	&	8	1	30	58		55
Kel-F Grade 300 ^d	25	e1/e	2.82	2.76	2,65	2.50	2,46	2,42	2,36	2.35	46.9		
		ten 8	148	. 225	212	140	96	75	Ż	51	99	. 23	
Kel-F Grade 300-P25	25	£1/6	₽.°	2.75	2.68	2.58	2.51	2,45	2.37	2.35	2.31	2.26	
		ten 8	126	207	234	50	175	214	186	150	93	93	
6) Polytetrafluoro-												•	
ethylene													
Dilecto (Teflon Laminate	25	e' /e	2,76	2.74	2.74	2.74	2.73		2.73				
cB-112T) ^f		ten 3	8.9	6.1	9		5.8		11.8				
(field L laminate)	250	e'/e	2.48	5°76	2,46	2,46	1 1						
		tan 8		36	18	1 7		2.5					
	%22 €22	ε'/ε°	2.70	2.68	2.69	2.69							
		tan 8	7.4	3.9	4.7	4.							

(Dow), d. Polychlorotrifluoroethylene (Kellogg), e. Plasticized polychlorotrifluoroethylene (Kellogg), f. 65-69% Teflon, 32-35% continuous-filament glass base (Cont. Diamond).

I. Solids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for ten 8 are multiplied by 10; frequency given in c/s.

	2.511010								2.08	9					٠													
	1x1010	3.10	24	3.10	5	2			2.08	3.7	5°0	5.1					•					2.50	23					
	3x109	3.15	38	:		1 1 1 2			2 . 1	1.5	1	1	2.50	6.8	12.7	,33	145					2.52	25	2.35	15	33	0°.0	4.8
	3x108	3,15**	31**	1		! ! !			2.1	1.5		!	2.50	80			1		٠			!	!	: ! !	!	:	t : !	! ! !
	1x108	3.15	5 †	1		1 1 1			2.1	ผ V	!	1 1	2.50	6	1 1	1	!	2,63	158	2,14	97	•		1	!	£ 1	8.4	8
	12107	3.15	53	!		!																						
	12106	3.16	걐	0 1 1		!			2.1	V	2.04	۷ ۷	2.50	€	72	62	1,10	2.71	150	2,14	7	ļ		:	1 1 1		> 100	3
	1x10 ⁵	3.17	108	1 1 1		:	3.21	27	2.1	۳ ۷	2°04	٧ ٧	2.50	3	170	2400	01/1	2.74	180	2.14	6.8	1 1 1	1	1	1	!	> 1000	95
	1x10	3,18	169	1		!	3.24	17.3	2.1	۳ ۷	40°2	ณ	2.50	2.7	!!!	10000	520	2.85	350	2.14	7	1	1	1	-	1 1 2	> 10000	B
1																•												1
	1x10 ²	3.35	361	, ;	1	1	3.26	99	2.1	۸ ر	2.04	91	2.50	18	!	*	!	3.42	917	2.14	18.5	!!!!	!	!	!		**	; ; ;
		£1/E	tan S	-1/0	د / د	tan S	€,/€]	ten 8	e'/e_	ten 8	e ¹ /e	ten 8	e1/e	ten 8	£1/€	ten 8**	a	e1/e	tan 8	e¹/e,	tan S	e1/e	tan 8	6,/6	ten 8	e*/e	tan S*	C
	ت ا	ام		Č	200		25*		25		100		25		25		,	25		25		25		25		25	,	
מסדותם היים	6) Polytetrafluoro-	Taring (motion laminate	DITECTO (TATTOT TOTAL	(1511-QD)	(field II laminate)				ط من				Chemelac M1405		Chemelec MI406			Chemelac M1407		Chemelac Mikil	(field L sheet)	(field !! sheet)		Chemelac M14128		Chemelac Mitlit		

25% calcium fluoride (U.S.Gasket). d. 80% Teflon, 20% carbon (U.S. Gasket). e. 86% Teflon, 12% ceramic (U.S.Gasket). f. 75% Teflon, a. 65-68% Teflon, 32-35% continuous-filament glass base (Cont. Diamond). b. Polytetrafluoroethylene (DuPont). c. 75% Teflon, 25% Fiberglae (U.S.Gasket). 3.75% Teflon, 25% glass (U.S.Gasket). h. 75% Teflon, 25% graphite (U.S.Gasket). *After temperature run. **Freq. = 1 x109. ***tan 8 not multiplied by 104.

Values for tan 5 are multiplied by 10; frequency given in c/s. I. Solids, B. Organic 3. Plastics j. Polyvinyl resins (cont.)

	6) Polytetrafluoro- ethylens (cmt.)	- 0 D		1x102	1x10 ³	1x10		1x106	1x10 ⁷	1x108	3x108	3x109	1x10 ¹⁰	2.5x1c ¹⁰
	Chemelac M418-2ª	3	e'/e	2.30	2.20	2.20		2,15	2.14	2.14			1	
	(desiccated 48 hrs. P_20_5)	_	tan 8	900	500	₹£		ผ	2. 1.	ι.				
	(dried in oven)	52	e1/e	ω.	2.15	2.15		2.15						
	•		ten 8	Ħ	9	2.7		1.8						
	Chemelac MI418-5	25	e'/e	2.27	2.23	2,18		2,16	2.16	2,15				
			ten 8	1,50	118	33		5.7	5.9	7.1				
	Chemelac M1422	23	¢'/e _o	2.72	2.72	2.72		2.72	2.72	2.72				
	•		tan 8	11.9	7.7	4.5		2.0	1.8	†• ℃				
	Chemelac M1423	3)	e1/e	1	1,308		!	!	1 1 1	! !	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	!	1.30	
			tan 6	:	1.81	!!!		1	! !	1 1 1	! ! !	† 1 1	62	
	7) Polyvinyl alcohol-													
	Elvanol 51A-05	25	e'/e,	8.2	7.8	7.2	5.5	5.2	4.5	! !	: : : :	3.74	3.50	3.46
			tan 8	7+30	O 1 11	280	720	8	1000	! ! !	1	550	505	620
		85	e¹/e°	00 1	100	33	16	10	7.3	! !	!	4.67		
				15000	13000	8	3600	2300	2000	1 1 1	1 1 1	1770	÷	-
	Elvanol 50A-42	23	€'/€°	14.0	10.4	8.0	9*9	5.7	5.0	1 1 1	1 1	3.75		
			tan 8	4050	1850	1150	1000	92	8] 1 1 1	!!!	715		
		89	e'/e _o	82	56	14	9.5	7.5	5.8					
			tan S	0096	8100	000†	1600	11,00	1,500			٠		
		100	E'/E	3000	00 1	ß	18	13	8.7	!	1 ! !	5.6	۲ ۰ ‡	
	4			15000	22000	20000	008;	2700	5600	1 1 1	! ! !	2300	3000	
	Elwanol 70A~05	56	€¹/€ ₀	t t i	:	58	27	17	7	1 1 1	1	4.12		
	•		tan 8	t t !	; ; ;	8200	5900	4100	2700	!!	1 1 1 1	0178		
	Elvanol 72A-51	56	e1/e°	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1 1 1	45.5	22.0	12.5	7.5	1	1 1 1	3.89	3.8	8.0
			tan 8	3 ! !	! !	7600	5100	3500	2500	1 !	1 !	0:79	989	730
	SITACOT 424-900°	25	e'/e	3.09	3.07	3.05	3.02	2.98	2.94	2.90	1 1 1	5.88		
			ten 8	64	20	55	56	65	64	37	!	28		
		83	e'/ਫ਼	7.3	7.15	5.9	3.75	3.25	2.95	2.30	: : :	2.87		
			tan 8	180	269	2100	1830	830	560	200	!	93		
3. 90%	a. 90% Teflon. 10% quant, /H a c.	14.5				•						•		

a. 90% Teflon, 10% quartz (U.S.Gasket). b. 75% Teflon, 25% quartz (U.S.Gasket). c. 80% Teflon, 20% titanium dioxide (U.S.Gasket). d. Air-filled Teflon (U.S.Gasket). e. Polyvinyl alcohol-acetate, 11-14% acetoxyl (DuPont). f. Polyvinyl alcohol-acetate, 0-1.5% acetoxyl (DuPont). g. Polywinyl acetats (DuPont).

I. Solids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for tan 5 are multiplied by 10 ; frequency given in c/s.

Butvar, Type E Butvar, Low OBC Butvar 55/98C 9) Polyacrylates Lucite HM-119d (now replaced by HM-140) Gafite cast polymerf (sheet sample) (rod sample)	140)			3.16 3.16 3.16 3.17 3.17 3.04 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.	11103 3.12 100 3.12 3.5 4.0 3.02 2.0 2.0 2.0 2.12 2.0 2.0 3.15 820 2.12 2.0 3.15 820 3.15 820 3.15	2.08 2.08 3.46 2.08 3.40 2.09 2.08 2.08 2.08 2.01 2.01 2.01 195 3.08 3.08	3.00 3.00 1.90 3.03 1.45 3.03 1.40 2.03 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.09 1.16 2.09 1.16	2.92 190 3.1 2.96 180 3.05 180 2.63 192 2.63 192 2.63 192 2.63 192 2.63 192 2.63 192 2.63 192 2.63 192 2.75 2.75 380 2.75 2.75 2.75 380 2.75 380 3.75 195 195 195 195 195 195 195 195 195 19	2.85 2.95 2.90 2.90 2.60 2.60 2.60 2.60 2.60 2.60 2.60 2.6	2.85 300 2.85 300 2.67 177 2.59 55 2.59 55 67 2.59 130 2.59 130	2.75	3110° 2.76 113 2.80 2.73 136 2.73 136 2.73 2.62 111 172 2.58 35.4 2.58 51.3 2.58 77	2.70 175 107 2.57 34 2.57 2.57 95	2.5x1010 2.7 115 175 175 2.57 32
Plexiglas ^g	tu	tan 5 27 e'/e o tan 8	•.	3.40	3.12	2.35	2.84	2.76	120		2. 66. 68. 68.	78 2.60 57	83 2.59 67	
	Ψ	80 e'/ 4° ten 8		4.30	3.80 895	3.34	3.00	2.80 320	2.70			2.56		, in

a. Polyvinyl formal (Shawinigan). b. Polyvinyl acetal (Shawinigan). c. Polyvinyl butyral (Shawinigan), d. Polymethyl methacrylate (DuPomt). e. DuPomt. f. Methyl and alpha-chloroacrylate (Gen. Aniline). g. Polymethyl methacrylate (Rohm and Haas).

I. Solids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for tan 8 are multiplied by 104; frequency given in c/s.

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tan 8
tan 6

a. DuPont. b. Polaroid. c. For sheet stock, various samples used for different freq sheet stock (Plax).

I. Solids. B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for tan 8 are multiplied by 10; frequency given in c/s.

COTT MILE TO COLOR TO		*			1							•	
10) Polystyrene (cont.)	To		2007	11103	11104	मार्थ	90मा	12107	11108	3x108	31109	11010	2,5x1010
	20	د./د	2.55		2.55		2.55	2.55	2.55	2.55	2.54		2.54
		ten o	۸ ک		۷ اه		α V	α V	۳ ۷	1.7	ь. 9		5.3
	8	61/6	2.55		1		!	!	1 1 1 1	1 1	2.		
		tan 8	12		E ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! !		;	1	 	1	5.0	6.5	
Styron C-176.	52	¢'/¢			i 6 9		1	!	1 1 1 1	!	2.54		
30% humidity		ten o	! !		1			1	1 1		3,5		
Styron C-176.	25	£1/€	:				!	1	1	1	2.54		
Control of the Party of the Par	`	ten o	:		# # # 1		 	!		!	6.4		
Strom C-176	25	6./4	Î		1			1			2.54	2.54	
Soft himidate		ten o	1		!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!		1	1 1 1	!	1	7.7	7.3	
Styrom C-176 + 0.5%	3	£1/E	1		! ! !		1	•	1	; ; ;	2,54		
namaffin, 90% humidita		ten o	1		1		! ! !	:	!	!	2.5		
Styron 411-A (formerly	8	61/6	2.55		2.55		2.55	2.55	2.55	2.55	₽.54	2.54	2.54
Exp. Plastic 0-247)		ten o	۳ ۷		α V		ν V	V V	۳ ۷	2.1	3.1	3.7	5.3
No.	62	61/6	2.55		2.55		2.55	2.55	2.55	\$! !	2.54	2.54	٠
	:	ten o	ឧ		V		α V	ณ	m	!	5.0	9	
Styron 475 ^b	52	£1/€	29.8		2.59		2.56	2.55	2.55	2.53*	2.53	2.53	
		tan 8	3.6		2.4		ਹ: †	7.6	Ħ	19*	36	17	
Styram 666 ^b	25	e'/e	2.54		2.54		2.54	2.54	2.54	2.54*	2.53	2,5	
		tan 8	1.75		٧ ۲		۲.	1,2	a ·	2.7*	3.1	3.4	
Styron 671 ^b	25	e1/e	2.55		2.55		2.54	2.54	2.54	2.54*	2.54	2.54	
		tan 8	16.		۸ د.		ď	•38	.57	1.47*	1.76	2.1	

IRS-23-B10012-444, XRS-23-B10012-520, XRS-23-B10016-D63, XRS-23-B10012-D107; Monsanto's Samples D-277, D-279 (extra purity), D-334. a. Polystyrene (Dow). Similar values given by Dow's C.244 and Q-247.1; Catalin's Lealin #1 Color 4000; Bakelite's XMS-44-621, b. Polystyrene (Dow). c. Polystyrene (Dow). Similar values given by Monsanto's Lustron Res. Sample D-276.

j. Polyvinyl Resins (cont.) Values for tan S are multiplied by 10; frequency given in c/s. I. Solids, B. Organic 3. Plastics

2.5x10 ¹⁰		•											2.63	at .									
2 0101x1			T•03	1.5					2,51	6.5	2.75	£ 1	2.63	2:3			ì	2.56	ന	2°43	5.6		
2.11	6.3		T-03	H	2.55	4.0	2,48	12.8	2.51	8.2	2.75	38	2.65	5.5	2,63	2.0		2.57	¥.	2,49	0.0	2.45	6
32108																		2.57*	#8° †	2.50*	1.9] 	1
2.14		1																2.57	2.1	2.52	1,2	!	1
2.14	e !		1.03	o V	2.55	٧	2.50	æ	2.58	1.4	2.83	55	2.65	۷ V	2.65	4		2.58	П	2.55	1.5	2.45	3.7
2.14	m		1.03	α V	2.55	V V	2.50	C)	2.58	2.3	2.86	65	2.65	α V	2.65	4		2.59	.7	2.56	2.2	2.45	0.7
2.14	e :	! !	1.03	۲ ۷	2.55	α V	2.50	۸ ر	2.58	2.5	2.90	7,4	2.65	V	2.65	6.5		! !	, !	2.57	3.6	2,45	α! V
41.5	4.6	1 1 1	1.03	, V	2.55	0.5	2.50	5.5	2.58	1.8	2.92	&	2.65	r	2.67	£)		2.60	19.	2.58	7.4	2.15	3.9
41.2 E0111	6.3	! ! !	1.03	۲ ۷	2.55	ч	2.50	6	2.58	1,3	2.95	73	5,66	18.4	2.7	19		2.6	9.	2.59	6.2	2,45	3.4
2.14	7.6	1 1	1.03	V V	2.55	Н	t 1 1	!	2.63	2.5	2.98	89	2.68	59	2.7	16		2.60	٠.	2.60	7.3	2.45	CV
¢:/¢°	ten 5	ten 8	د./د	ten 3	e'/e	tan 3	e:/e	ten &	e1/e	tan S	e'/e	tan 8	£1/6	tan 8	£1/€	tan 8		e1/e2	tan 8	e 1/e	tan 8	£1/e	tan 6
7°C	27		25		25		25		25		25	•	8		78	•	860	25		25		25	
10) Polystyrene (cont.)	Foem Q-103, 90%	humidity	Styrofoam 103.7		Polystyrene cast in	onom	Polystyrene cast in	o tig	Experimental Plastic	0764.6	Experimental Plastic	0767.2ª	Styramic #18d	•			11) Misc. Polystyrenes	Exp. Plastic 0817.1		Exp. Plastic Q405		Poly-p-xylylene	

50% chlorinated diphenyl (Monsento). e. Poly alpha-methylstyrens (Dow). f. Polyvinyltoluene (Dow). g. Pressed fibers (Polaroid). a. Dow. b. 99.75% polystyrane, 0.25% filler (Dow). c. From Dow's N-100 styrene (Lab. Ins. Res.). d. 50% polystyrene, #Freq. = 1×10^9 .

I. Solids, B. Organic 3. Plastics j. Polyvinyl Resins (cont.) Values for tan 8 are multiplied by 10"; frequency given in c/s.

12) Styrene copolymers	BT.6				•		,		,				
linear	o El		12102	14103	1210	14105	1×10	1x107	12108	3x108	3x109	121010	2.5x10 ¹⁰
Styrene-2,4-dimethyl.	25	€1/4°	2.53	2.53	2.53	2.53	2.52	2.52	2.52	2.51*		2.49	
styrene copolymer		ten 8	1.6	1.3	0.8	2.0	6.0	1.2	1.5	*0°4		8,9	
Styrene-acrylonitrile	25	E1/E	5.96	2.95	2.92	2.87	2.80	2.78	2.77	2.77*		2.76	
copolymer		tan S	59	63	<i>L</i> 9	<i>L</i> 9	49	8	14	¥0 1		45	
Darer copolymer 3 ^b	25	e'/e _o	2.53	2.53	2.52	2.51	2.50	5°49	2.49	:		2,45	
•		ten 8	23.7	21.5	30.9	38.9	34.8	56.8	23.8	3 t 1		20.9	
Darer copolymer 43E	25	¢1/¢°	2.54	2.54	2.54	2.54	2.54	2.54	2.54	-		2.53	•
		tan 8	5.5	2.8	2.2	2,8	3.9	6. 9	8.2	1		13	
Daren copolymer I-34	25	€¹/€°	2,55	2.54	2.54	2.53	2.52	2.52	2.51			2,48	
		tan 5	20°.	12.7	17.5	19.5	12	15	ት ር	-		15	
Daren copolymer L-43	25	e'/e _o	2.56	2.56	2.56	2.56	2.55	2.55	2.55	1		2.54	
		tan 8	7.3	2.5	2.3	2.2	ю	#	5.5	1 1		11.6	
Styraloy 22 ⁶	-12	e'/e,	ᡮ <u>.</u> S	ተ.ሪ	₽ . 5	4°8	4.5	2.4	1 1	i		2,4	
		tan 8	က	89	4	15	36	52		;		18	
	23	e'/e _o	‡ • ℃	†• ℃	4.5	₽ . 5	ቲ•ሪ	₹. 2	2,10	2.40		2°7	4.5
		ten 8	6	9	ار	7	12	30	52	91		†;	18
	81	e1/e2	₽ . 5	4.5	4.5	4. 2	4.5	2.4	:	!		4. ℃	
η		tan 8	16	10	œ	9	9	13	1	1		55	
Marbon S ^a	25	e'/e _o	5.62	5.62	5.62	2,61	2.60	2.60	2.57	2.55*		2.54	
Code 7206		tan 8	17.4	14.1	13.8	13.8	18.3	22.1	25.2	20.6*		19	
Marbon S-1	25	€'/€°	2.55	2.55	42.5	2.54	2.54	2,54	2.53	2.52*		2.52	
Code 7254a		tan 8	10	9	3.5	3.9	6.1	7.9	8.3	10*		12.5	
Marbon 8000	25	61/6	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.52*		2.51	
٩	÷	tan S	5.4	#	3.2	3.0	0.4	5.0	7.2	*0.6		10	
Marbon 9200 ¹	25	e'/e°	5.60	2.57	2.56	2,56	2.56	2.56	2.55	2.52*		2.52	
		tan 8	5.4	3.1	m	4.9	6.7	6	07	11.8*		11.5	

butadione (Marbon). o. Butadione-styrone copolymer ca. 15% butadione (Marbon). f. Butadione-styrone copolymer ca. 14% butadione 4. Am. Cyanamid. b. Dewey and Almy. c. Copolymer of butadiene and styrene (Dow). d. Butadiene-styrene copolymer, ca. 108 (Marbon).

*Freq. = 1 x 109.

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12) Styrene copolymers, 11near (cont.)	T _o		12102	1+103	140111	20171	90171	12107	12108	60171		12:10	2.5110
Piccolastic D-125	23	و،/د	2.58	2.58	2.58	2.58	2.58	2.58	2.58	1		2.52	
	•	tan 8	a	1.5	m	н	4	1.5	က	!		5	
Styrene (50%) and 1,3,5-	25	61/6	2.70	2.70	2.70	2.70	2.70	2.70	2.70	5.66		2,65	
trivingl-2,4,6-trichlorg- benzene (50%) copolymer	င့်သ	tan 8	8.5	8.9	7.6	10	Ħ	16.2	56	8	ದ	19	
Styrene (50%) and 1,4-d1-	- 26	e' /e	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70		2.70	
viny1-2,3,5,6-tetrachloro-	- or o	tan 8	9	4. Ր	8.2	7.8	8.2	12.0	8	13.2		13.6	
201-S	£)	61/6	2.40	2.40	2,40	2.39	2.39	2.39	2.38	1 1 1		2,35	
		tan B	21	7,7	13	32	80	9	9	!		7.1	
S-60°	25	د ا/د	2.50	5,49	2,48	2,46	2.46	2,15	2,45	:		₽. 14. 2	
		tan 8	27	1 2	8	15	10	9	#	1		ታ•	
13) Styrene copolymers cross-linked	e e												
Copolymer 8012 ^d	85	(1/6)	2.58	2.58	2.58	2.58	2.58	2.57	2.55	2.54	2,53	2.52	
		ten 8	2.7	1.3	.87	7.	1.1	ત્ય	3.8	6.8	8.8	8.9	
Plastic EK2784 ^d	25	£1/€	2.59	2.59	2.59	2.56	2.56	2.56	2.56	2.55	2.54	2.52	
		tan 8	2.6	1.5	1.2	1.4	1.8	2.3	₽ . 4	8.8	2.9	J.4	
Exp. Plastic 9-166	23	e ¹ /e	₹ .€	3.40	3.38	3.36	3.32	3.22	3.05	!	2.71	2.62	
		tan 8	1,5	55	2	110	180	350	024	1 1 1	315	250	
	&	e1/€	3.25	3.23	3,21	3,19	3.16	3.12	3.05	1 1 2 4 5	2,85	2.63	
		tan 8	550	95	1 1	38	55	011	250	•	570	550	
Erp. Plastic Q-166	23	£1/€	94.4	24.4	4.37	4.30	4.21	4.09	3.95	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	3.78	3.70	3.6
plus Fibergias		tan 8	160	110	96	120	180	250	320	!	241	231	500
	62	E1/E	4.5	4. 1	†• †	4.3	2.4	1.4	0.4	!	3.8	3.7	
		tan 8	88	320	140	86	8	130	220	!	415	024	
Exp. Plastic Q-200.5	56	e'/e	2.55	2.55	2.55	2.55	2.55	2.55	2.55	!	2.55	: ! !	2.54
		tan 8	. #	о V	α V	8 ∨	C)	3.4	4	1 1 1	5.2	 	† ₹
	100	e'/e,	2.56	2.56	2.56	2.56	2,55	2.55	1	!	2.55*		
		tan 8	8	2	a	0 V	0 ∨	۳ ۷	1 1 2 1	:	* 0*-		
	•				٠,						מ	80,	

a. Methylstyrene-styrene copolymer (Penn. Ind. Chem.). b. Sprague (two different castings measured in the ranges $10^2 - 10^8$ and $10^9 - 10^{10}$ c/s.) c. Standard Oil Dev. Co. N.J. d. Catalin. e. Dow. f. Cross-linked with o-, m-, p-divinylbenzenes (Dow). Whearurements made at $78^{\rm O}{\rm C}$.

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13) Styrene copolymers cross-linked (cont.) To	Total		11102	11103	1210	रेशमा) olxi	12107	12108	3x108	3x109	121010	2.521010	
Exp. Plastic Q-344	1 72	e'/e,	2.40	2.40	2.39	2,38	2.38	2.38	2,38	1		2,31	2.31	
		tan 8	11	8	ድ	8	ο,	2	7	:		8.6	OT.	
	8	£1/€	4°0	4. €	2.39	2,38	2.38	2,38	2.35	1 1 2		2.31		
		ten 8	21	17	75	16	45	2 1 7	19	!		15		
Exp. Plastic Q-475.5	83	e1/e	2.51	2.51	2.51	2,51	2.51	2.51	2.51	:		5,49		
		tan 8	4	α	ď	4	2	6	6			ဆ		
	&	e1/e	2.48	2.48	2,48	2.48	2,48	5°148	2.48	! !		2.47		
		ten 8	9	. #	αį	CU.	. #	6	†T	1		1,1		
Pliolite S5 ^b	22	e'/e,	2.58	2.58	2.58	2.55	2.55	2.55	2.55	2.53*		2,51		
		tan 8	6.8	3•3	2.1	2,5	₽. 4	7.3	7.8	*9* 2		2.9	-	
Pliolite 83 ^b	25	e1/e	2.58	2.58	2,58	2.58	2.58	2.58	2.58	2.55*		2,52	•	
•		tan 8	7.7	3.5	2.1	1.8	5.6	3.6	6.2	1.5*		7.5		
Pliolite SGB ^b	25	و،/ھ م	2.58	2,58	2.58	2.58	2.58	2.58	2.58	2,53*		2.51		- 4
	٠	tan 6	9	2.9	4.8	1.9	N.	3.7	6.8	10.6*		80	+0	40 .
Pliolite S6 ^b	25	e1/e	2.58	2.58	2,58	2.58	2.58	2.58	2.58	2.57		2.52		-
		tan 8	9.9	2.8	2.1	2.1	2.1	m	5.5	16		6.3		
Resin C	25	e1/e0	2.51	2.51	2,51	2.51	2.5	2.50	2.47	1		2,46		
•		tan 8	&	10	13	27	34	31	59	1		39		
Rerolite 1422	35	e'/e,	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55*		2.54		
		tan 8	₽ .5	1.1	Ħ	1.1	1.3	a	3.8	r*9*t		J. 4		
Bureau of Standards	25	e 1/e	2,64	2,62	29.2	2,62	2.62	29.5	29.6	2.60				
Casting Resin	٠	tan 8	8	15.6	11	7	1.4	6	ָ ה	#				
Vibron 140 ^f	8	e,/e	2.59	2.59	2.59	2.58	2.58	2.58	2,58	1		2.57		
	-	tan 8	. #	70	80	12	16	19	8	!!!		17.5		
Vibron 141 ^f	23	£1/€,	5.64	5.64	2.64	2,63	2,62	5.62	29.2	!		2.62		
		tan 8	9	7	1	19	33	39	34	:		28		

a. Cross-linked polystyrene (Dow). b. Goodyear. c. Esso C oil in styrene-divinglbenzene solution (Polarcid). d. Rex Corp. 9. 32.5% polystyrene, 53.5% poly-2,5-dicillorostyrene, 13% hydrogenated terphenyl, 0.5% divinylbenzene (U.S. Bur. Stand.).

f. U. S. Rubber.

Freq. = 1x1.09.

I. Solids B. Organic 3. Plastics j. Polyvinyl resins (cont.) Values for tan 8 are multiplied by 10; frequency given in c/s.

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14) Polystyrens plus		12102	12103	12104	32105	12106	12107	11108	32108	32109	121010	2.5x1010
91%.	- e¹/ɛ¸		3.85	3.85	3.85	3.85	3.8	!	3.8	3.6	3,46	
			1 2	93	33	32	37	!	310	386	1 48	
Polystyrene 70%, 25	e1/e2	1 1 1	1	i	!		:		11*	1.6	8.8	
carbon 304	tan 8	!	! ! !	-	1 1 1	į	!	:	2300*	2500	1100	
Polystyrene 50%, 25	e'/e,		į	!	1	 	1	1 1 1	25.9*	20.8	19.4	
çarbon 504ª	ten 8		:	i	!	 - - -	!	i i i	1300*	2600	2800	٠
(molded at 1000 p.s.1.) 25	e'/E		:		1 1 1	1.	 	1	36*	25	₹ 2	
(*i.a.d occident of position)			:	:	1	1	!	!	\$009₺	6200	3000	-
Lustrex Loaded Glass Mat ^b 25	e'/e		3.04	3.02	3.00	2.97	2.97	2.96				
(field L plane of laminate)			8.8	₹° 2	. 2	8.3	10.6	13.8				
(field in plane of 25	e'/e,		\$ \$ 1	!		!	1		1	3.07	3.07	
laminate)	tan 6		1	;			1	: : :	1 1	E E	36	
Polyglas P (experimental) 24	4 e¹/e,		3.36	3.36	3.36	3.36	3.36	:	!	3.35	3.33	3.32
	ten 5		7	2	7	t-	7	1	1	7.8	₽	14.0
62	€ 1 / E		3.36	3.36	3.36	3.36	3.36	!	1 1	3.35	3•33	
	tan 8		17	12	6	80	7	!	!	† T	19	
Polyglas Pt(technical) 25	e 1/e		3,38	3.38	3.38	3.38	3.38	!	3.36	3.35	3.34	
	tan 8		6	6	6	6	6	1	9.6	11.7	13	٠.
15) Polychlorostyrenes										•		
Plantic CY-8 24	e'/e		2.61	2.60	2.60	2,60	5.60	5.6	1	2.60	1 1	2.59
	tan 8		ณ V	ณ V	α V	С V	α	2.5	1	3.1	1	53
8	£1/€		2,61	2.60	2.60	2.60	2,60	2.6	1	2.60		
	tan 6		ત	ω V	რ V	Υ	m	4	!	7.3		٠
Plastic CQ-10DM 25	e1/e		2.70	2.70	2.70	2.70	2.70	5.69	2.67	5,66		
	tan 8		ī	70	9	∞	10	11	่น	10.8		
100	e'/e		2.65	2.65	2.65	2.65	2.65	2.65	2.65	2,65		
	tan S	33	17	ω	9	2	בו	16	17	17	*	

a. Cabot's #9 (Lab. Ins. Res.). b. 30% fiberglas (Monsanto). c. 18.6% Dow's C-244 polystyrens, 81.1% Corning's 790.8lass powder, 0.25% paraffin, 0.1% Dow Corning's Ignition Sealing Compound No. 4 (Lab. Ins. Res.). d. Id. except that Monsento's polystyrene was used (Monsanto). e. 97% poly-2,5-dichlorostyrene (Mathieson). f. Copolymer of 50% 2,4,-25% 2,5-, 25% 2,3-, 2,6- and 3,1:-dichlorostyrenes (Mathleson).

*Freq. = 1x109.

I. Solids B. Organic 3. Plastics 1. Polyvinyl Resins (cont.) Values for tan 5 are multiplied by 10; frequency given in c/s.

15) Polychlorostyrenes			i				•		•	•			
	ပ မ		12102	12103	1210	12105	90171	12107	30171	32108	32109	1100	2.521010
ichloro-	32	£1/€	2.94	2.93	2.91	2.88	2.85	2.80	2.77	# # # #	2.72	2.70	
styrene &		tan 8	89	2	57	52	₹	35	27	:	8	8	
	88	61/6	3.0	2,90	2.85	2.83	2.78	2.73	2,68	1	2,65		
		ten 8	503	151	115	77	63	8	55	:	32		
A	103	e1/e	3.08	2.92	2.85	2 . 81	2.8	8.	2.75	:	2.7	2.7	
		tan 8	355	275	200	120	88	78	20	!	8	8	
H	153	£1/E	6.0	6.4	3.7	3.3					*		
		tan 6	820	1700	1400	750							
Exp. Plastic Q-409 ^b	54	e'/e,	2.60	2.60	2.60	2,60	2.60	2.60	2.60	\$ 1 1	5.60	5.60	5.60
		tem 5	임	7	7	, L	4	#	<u>د</u>	:	8.7	검	91
	8	£1/€	5.69	5.69	2.68	2.68	2.68	2.67	2.65	1	79.5	5.60	
	*	tan S	50	25	1,4	æ	5.5	5.5	7	1	11	18	
Polyglas D*(experimental) 24		α'/ε _ο	3.22	3.22	3.22	3.22	3.22	3.22	3.22	!	3.22	3.22	
		tan 8	7	9	7	ار ا	9	9	7	1	ထ	8.5	
	62	e'/e	3.2	3.5	3.2	3.2	3.8	3.2	3.2	!	3.2	3.2	
		ten 8	34	17	11	80	2	2	80	!	13	16	
Polyglas D ⁺ (technical) ^d	54	e'/e	3.25	3.25	3.25	3.25	3.25	3.25	3.24	!	3.23	3.22	3.22
		tan 8	m	e	4	#	7	9	7	:	15	£1	†T
16) Poly-2,5-dichloro- styrene plus fillers													
Poly-2,5-dichlorostyrene	23	€1/€	5.30	5.30	5.30	5.30	5.30	5.30	5.30	 	5.30	5•30	
(58.1%), T10, (41.9%)		tan 8	56	41	. ω	5	က	m	3		9	8.5	
•	45	€1/€	10.2	10.2	10.2	10.2	10.2	10.2	10.2	1 1	10.2	10.2	
(34.7%), T10, (65.3%)		tan 8	16	ထ	9	#	en	m	က		7.5	13	
•	23	e'/e,	23.6	23.4	23.2	23.1	23.0	23.0	23.0	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	:	23.0	
(18.6%), T10 ₂ (81.4%)		tan 8	9	T	30	8	12	6	æ	:	!	15.6	٠

s. ca. 956 (Monsanto). b. Copolymer of o- and p-chlorost renes (Dow). c. 34.9% Monsanto's poly-2,5-dichlorostyrene; 64.9% Corning's 790 glass powder, 0.1% paraffin war, 0.1% Dow Corning's Ignition Sealing Compound No. 4 (Lab. Ins. Res.). d. Id. (Monsanto). e. Monsanto's Styramic HI; Titanium Alloy's Tam Ticon T, heavy grade (Lab. Ins. Res.).

; frequency given in c/s.
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Values for tan 8 are multiplied by 10
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	31109	5.91	8.9	16.4	11.7	į		į	į	i	i	70.4	H		į	•	į	1			р. С	25	2.7		о. П	30	ี ๙	4
	31108	6.01	7	1	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!		!	!	! ! !	1	1	1 0	1	1 1 1	1 1 1	1	† . !	:	1		ì	1	:		l 1 3 6	1	!	1 1 1
	11108	6.05	9	5.15	5	9.57	10	17.0	23	20.8	33	±•03	m	7.6	9	15.7	13	18.9	&		1	!	1	!!!	1		!	1
	11107	6.08	9	5.17	<i>#</i>	9.60	6	17.2	g	21.0	2	4.03	m	7.6	9	15.7	7	18.9	2		1	1	1 1 1	1	1 1 1	1	 t 1	
	12106	6.09	7	5.18	m	6.61	10	17.3	30	21.2	8	^{†0°} †	<u>+</u>	7.6	7	15.7	7	18.9	11		:	1 1 1		1 1	!	1 1	. 1 1 1	1
	1105	60°9	97	5.19	ᆦ	8.62	12	17.3	걸	21.2	100	90*1	9	7.6	17	15.8	12	18.9	16		!	i i	!	1	1	1 1	1 1	! ! !
	40171	6.10	† T	5.20	9	6.63	91	17.4	78	21.6	180	4.07	80	7.6	25	15.8	25	19.1	25		1	1	; ;	1	t t	1	; ; ;	1
	14103	6.10	8	5.20	10	9.65	37	17.4	130	22.8	380	80°4	1,1	7.6	2 4	15.8	30	19.3	35			3	1 3 8	1 1	1 1	1 1 1	! !	! !
	12102	6.10	35	5.20	8	9.65	† 1	17.9	250	24.5	780	4.10	42	7.6	8	15.8	30	19.4	52		!		!	-	1	i # #	1	;
		٤,/و	tan 8	و،/و	tan 8	e1/4	ten 3	£1/€	ten 6	e'/e	tan 8	e'/€	tan 6	e'/e,	tan S	e'/e,	tan 6	e'/e,	tan S		η/, n	ten S	e'/e_	tan 6,	ת/וח	tan o	e'/e	ten 8
90	o _F H	ຮູ		23		42		23		23		23	•	25		23		23			25				83			,
A DOTAL O S. dichlorostyrene	plus fillers (cont.)	Poly-2,5-dichlorostyrene	(38.24), MgT10, (61.84)	Poly-2,5-dichlorostyrene	(63.0%), SrT10, (37.0%)	Poly-2,5-dichlorostyrene	(40.5%), SrT10, (59.5%)	Poly-2,5-dichlorostyrene	(25.24), SrT10, (74.84)	Poly-2,5-dichlorostyrene	(14.4%), Srr10, (80.6%)	Poly-2,5-dichlorostyrene	(66.6%), Barro, (33.4%)	Poly-2,5-dichlorostyrens	(32.9%), Barrio. (67.2%)	Poly-2,5-dichlorostyrene	(23.5%), Bario, (75.5%)	Poly-2,5-dichlorostyrens	(21.0%), Bario, (79.0%)	Poly-2,5-dich.crostyrene	(94%), Fe (66) ^d							

a. Monsanto's Styranic HT; Titanium Allor's Tam Ticon MC (Lab. Ins. Res.). b. Monsanto's Styramic HT; Titanium Alloy's Tam Ticon S (Lab. Ins. Res.). c. Monsento's Styramic HT; Titanium Alloy's Tam Ticon B (Lab. Ins. Res.). d. Monsento's D-1795; Plastic Metals' Plast-iron, minus 2(0 mesh, annealed (Lab. Ins. Res.).

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	16) Poly-2,5-dichlorostyrene	sue					ŧ	•	•	•		7	
	plus fillers (cont.) To			1x10 ²	11103	11104	12105	90171	12107	14108	3×108	32109	111010
	styrene		ن ا / و َ	1 1	:		!	i	!	!	:		5.2
	(60%), Fe (40%)	±	οπ/11	1 1 1	!			!	!	í ! !	; ; ;		96•
		ب	an S _d) 			:	!	:	:	1		190
		t	an S	!	P 1 1			i	:	:			5620
		85 F	1/و	1	:		i	į	!	!	: :		
			ο _{π/,} ,	!!!!	!		1	!	:	1 2 1	!	1.27	٠
		ٽ	an S _d	1	:		:	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	:	1	!!!	:	٠
		+ 3	an S	İ	!		1	!	1 1	t 1	-	3000	
	ene	25 €	٠,/﴿	8.6	2.6		9.2	0.6	8.7	! ! !	8.08	6.93	
	(49.3%), re (50.7%)	1	,•/μ _ο	į	3.00		!	1	2.70	!	2.00	1.24	
		Ţ	an da	110	130		190	550	320	!	601	1 19	
		Ţ.	an S M	1 1	;		1	!	340	!	2254	3170	
	Poly-2,5-dichlorostyrene	25 €	, /e	!	1		! ! !	1	-	į	13.8	10	
	(40.7%) Fo (59.3%)	1	1/µ°		!		!	1	-	!	2.6	1.37	,
		Ţ,	an S _d	!	!			!	į	;	1950	1400	
		Ţ	en S	:	1		1 1 1		:	:	2810	4500	
	Poly-2,5-dichlorostyrene	25 e	1/e	; ; ;	# !		!!!	!	!	! ! !	2.78	2.76	5.64
	$(924), \text{ Fe}_3^{04} (84)^9$	=	۱/ _۳	1 1	:		# !	1 1	!	!	1.05	1.03	1.03
		ت پ :	an S _d	!!!!	: :		# # #	1 1 1	!!!	!	13		
		Ţ	an S _m	!	1 1		!	1 1	1	:	11	500	η 5 0
	•	25 €	٠, ﴿	!	!		1			!	3°5	3.2	3.2
	(83.7%) Fe ₃ 0 ₄ (16.3%)	#	·/π°	- 1	1 4		-	!	i	!	1,12	1.07	66•
		ţ	en S _d	!			i		!	; ; 1	18		
		Ţ	an S _m	!	-		:	!	!	1 1 1	200	750	580
	Poly-2,5-dichlorostyrene	W	١/و٠	1 1	!		į	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	; ;	:	3.45	3.44	
	$(75\%) \text{ Fe}_30_4 (25\%)^9$	1	1/n	? !	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!		!	t ! !	! .		1.19	1.12	
-		Ţ,	an S _d	!	!!!!			!	1 1	! !	56		
		Ť.	tan S		:		!	:	1	} 	250	290	

a. Monsento's D-1795; Plastic Metals'Plast-Iron, minus 200 mesh, ennealed (Lab. Ins. Ref.). b. Monsento's D-1795; Mallinckrodt's magnetite (Lab. Ins. Res.).

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91	्रा	25 e'/	/ , #	tan	ten	25 €'/	/. #	tan	tan	25 e¹/	/. n	ten	tan	25 €1/	\n 1	tan	tan	25 61/	/ ₁ π	tan	tan				ten	Ĭ.			tar
16) Poly-2,5-dichlorostyrene	plus fillers (cont.) Toc	Poly-2,5-dichlorostyrene 2	(65.9%) Fe ₂ O _h (34.1%) ^B	r n		Poly-2,5-dichlorostyrene 2	(56.2%) Fe ₃ O ₁₁ (43.8%)	 		Poly-2,5-dichlorostyrene	(46.0%) Fe ₂ 0, (54.0%)	t n		Pely-2,5-dichlorostyrene	(35.7%) Fe ₃ 0, (64.3%) ^B	t n		Pcly-2,5-dichlorostyrene 2	(24.54) Fe ₂ 0, (75.54) ^B	t n		Poly-2,5-dichlorostyrene	(38.55%) (14th, Fe), 01, (61.45%)	† n		Poly-2,5-dichlorostyrene	(21.3%) (Ma, Fe), (78.7%) ^b	t n	

a. Monsanto's D-1795; Mallinckrodt's magnetite (Lab. Ins. Res.). b. Monsanto's D-1795; iron-manganese oxide (Lab. Ins. Res.).

I. Solids B. Organic 3. Plastics		Polyvin	 Polyvinyl Regins (cont.) 	(cont.)	Values	for ten 5 are multiplied by 10; frequency given in c/s	S RITE E	ultiplie	a by 10 ^k	freque	ncy give	n in c/8.
17) Polyvinyl	o E		50,5	آرائ	- 1	30.25	905	700-6	80	න	6	10
<	، اد	•							1770		100	1210
Polyvinylcycloberane	₩	E'/E	2.25	2.25	2.25	2.25	2.25	2.25	2.25	1	2.25	2.25
		tan 8	15	αı	ณ V	ณ V	cu V	α V	8 ∨	! ! !	1.8	3.9
18) Poly-a-vinylnaphthalene	21											
Poly-a-vinylnaphthalene	1 70	e'/e°	1 1	2.6	5.6	5.6	2.6	5.6	5.6			
		tan S	1	9.5	6.7	7.5	8.7	13	83			
19) Poly-2-vinylpyridine	÷											٠
Poly-2-vinylpyridine	25	e'/e _o	16.4	જે. *	4.26	3.77	3.56	3.33	3.1	3.06	2.98	
		tan 8	360	94	560	000	260	02¥	5 8 0	240	135	
2-Vinylpyridine-styrene	23	e'/e _o	3.14	3.38	3.26	3.13	3.00	2.90	8°.	1 1	2.76	
copolymer b		tan S	168	230	270	290	560	185	120	1 1 1	જ	
20) Poly-N-vinylcarbazole				٠								
Polectron #24°	25	e 1/e	2.95	2.95	2.95	2.95	2.95	2.95	2.95	!	2.88	
		ten 8	13	9	9	5	4	7	9	*	9.3	
	&	e'/e,	2.95	2.95	2.95	2.95	2.95	2.95				
	-	tan 8	19	ឧ	∞	6	6	7				
k. Polyesters												
Laminac 4115 ^d	25	e,/e,	3.24	3.22	3.20	3.17	3:12	3.07	2.94	2.87*	2.83	2°5
		ten 8	37.5	43.2	68.3	113	135	147	141	*201	93	88
Experimental Resin	25	e1/e	4.15	4.05	3.93	3.77	3.58	3.44	3.20	1	3.00	2,95
FDL7-669"		tan 8	155	192	242	306	313	282	240	1	155	1,42
ieminac PDL7-627	25	e'/e _o	3.26	3.25	3.23	3.18	3.08	3.06	3.03	2.96*	2.32	2.86
વ		tan 8	50.5	15°8	67.8	115	140	148	135	*101	B	4.16
Leminac FDL7-650	52	€¹/€°	3.02	3.00	2.98	2.95	2.89	8. 8.	2.78	1	2.74	2.72
٩		tan 8	39.1	45.0	60.2	100	119	411	108	}	8	96
Leminac 4-205 ^u	52	e'/e _o	4.45	4.36	₩2. 4	4.03	3.86	3.69	3.49	1	3.21	3.15
		tan 8	147	162	219	301	360	345	340	\$ \$!	240	243
Formica 265	25	£1/£°	5.21	5.10	5.00	1,89	4.70	4.35	£ 1	3.83*	3.69	3.49
(field II laminate)		tan 8	191	162	212	317	१ ८४	570	i i !	¥8£	145	125
(field I leminate)	25	e:/e	4.77	4.70	¥.68	7.60	4.45	4.17				
		ten 8	125	108	131	185	302	418				

a. Hydrogenated polystyrene (Dow). b. Lab. Ins. Res. c. Poly-N-vinylcarbazole, 1.3% HB-40 oil (Gen. Anilins). d. Amer. Cyanamid. e. 50% Shell's IAP 85/80, 50% paper (Formica). Freq. = $1x10^9$.

I. Solids B. Organic 3. Plastics (cont.) Values for tan 5 are multiplied by 10; frequency given in c/s.

k. Polyesters (cont.)	o E		1x10 ²	12103	4011	रेशा रे	90171	1x107	12108	3x108	32109	010171
Formica Z80a	25	e'/e	4.76	4.75	7.72	4.65	94.4	80°†	3.77	3.53*	3.41	3.36
(field lawinate)	,	ten 8	175	160	210	310	024	565	500	390*	310	250
(field L laminate)	25	e¹/e,	4.52	टम • म	4.38	4.33	4.15	3.91	·	٠		
		tan 8	92	%	130	197	330	아				
Glastic S ^b	56	e¹/e,	3.50	3.39	3.29	3.22	3.16	3.14	3.07			
		ten 8	330	250	160	86	300	105	130			
Glastic MF	56	e'/e,	3.92	3.8	3.76	3.72	3.65	3.57	3.53			
		tan S	270	185	135	125	130	130	135			
Plaskon 911°	42	e1/e	3.88	3.81	3.75	3.66	3.56	3.42	3.25	3.17	3.07	3.02
		tan 8	88	125	165	210	240	540	550	217	175	158
	&	£1/6	14.27	4.17	90°4	3.95	3.83	3.70	3.55	!	3.26	3.10
		ten 8	165	150	155	500	270	320	340	1	299	5#8
Marco Resin MR-210d	25	E1/E	3.37	3.35	3.31	3.25	3.16	3.08	1	2.90	2,8	8. 8.
		ten 8	53	ደ	3	102	150	170	i	149	901	123
Marco Resin MR-23Cd	25	E1/E	4.56	4. S.	04.4	4.28	41. 4	3.88	4 1 1	3.24	2.32	2. 88.
		tan 5	130	140	170	220	340	570	i i	810	500	1,10
Marco Regin MR-250d	25	E1/E	3.27	3.24	3.20	3.15	3.10	3.06	2.90	2,86	2.77	2.73
		tan 6	92	72	କ୍ଷ	108	138	165	190	183	130	135
Leminating Resin MP.	25	e1/e	1	:		1 1 2	1	i ! !	1 8		1	4.26
Glass reinforced	,	tan S	1	1	1	1	1	1	1 1		1 1	110
Lawinating Resin MT.	25	€1/€	1 2	1	1 1	1 1	1	1	1 1	1 1	1 1	ħ2° †
Glass reinforced	ì	tan o	1 2 1	! ! !	1 1	1 1	1	1	1 1	;	1	88
Laminate BD-44名	77.2	e'/e,	3.32	3.28	3.22	3.19	3.14	3.08	3.02	2.99	2.93	2.91
		ten 8	93	8	86	105	125	140	150	132	109	110

a. 52% Shell's DAP 25/50, 49% yarn fabric (Formica). b. With Fiborglas (Laminated Plastics). c. Unsaturated polyester (Libby... and Fiberglas ECC-181-114 (Naugatuck). f. Resin of 45% polyethylone tetraclophthate-maleate alkyd and 55% triallyl cyanurate Owens-Ford). d. Unsaturated polyester (Marco). e. Resin of 50% Vibron x-1039 alkyd and 50% triallyl cyanurate plus catalyst plus catalyst and Fiberglas ECC-181-111 (Naugatuck). g. Selectron 5003, Fiberglas (Ovens-Corning). Freq. = 1x109.

				•	.;	ند			!	(i		
	k. Polyesters (cont.)	O _E		रूपम	1103	न्त्र	20171	न्मा ०	12107	ू श्री	3x10		141010	2.521010	
	Laminate BK 1648	42	¢,/¢°	4,12	4.10	60.4	4.07	4.05	1.03	00.4	3.98		3.9		
			tan 5	29	58	63	&	96	110	312	108		130		
	Stypol 16B ^b	25	e'/e,	-	!	!	t : :	;	1	1	1		2,88		
	•		tan 6	1	1	1	:	1	!	!!!	!		180		
	Stypel 16c ^b	23	e'/e _o	1 1	1 1 2	1 1	1 1	!	\$ 1 1	 	!!!		2.75		
	•		tan 8	1	!	:	=	1	!	!	1		160		
	Stypol 16D ^b	25	e'/e,	:	1	1	!		1 1 1	-	!	1	2.81		
			ten 3	1	1	! !	1	1	!	!	;		애디		
	Paraplez Pl3	25	6,/6	4.02	00°†	3.92	3.92	3.65	3.32	3.08	2.89*		2.77		
			ten 8	73	108	184	310	530	28	009	* 0ंप्:र		290		
	Paraplex P43 ^c	25	¢,/e°	3.23	3.22	3•19	3.16	3.11	₹0•€	2.98	2.89*		2.85		
			tan 8	33	£ 1	88	98	130	160	160	110*		&		
	Polydiallyl phthalate	26.8	e1/e	3.60	3.57	3.50	3.42	3.35	3.24	3.1	1		2.95		
			tan 8	101	8	118	150	88	241	195	1		118		
	Allymer CR-39	75	e;/e	4.18	4.14	4.03	3.85	3.52	3.27	3.07	-		1 6		_
			tan 6	8	120	210	380	520	994	330	!		1 1	165	48
		₽	e'/e ₀	4. 90	₹8°±	4.70	4.47	4.18	3.85	3.45					••
			tan 8	130	140	1.70	250	01/1	O 1 8	047	1	370			
	Allymer CR-39 laminate	2 <u>5</u>	€¹/€°	±8•4	4°.80	4.73	4.57	4.37	4.17	3.98	1	3.78			
	t		tan 8	73	&	120	208	315	295	205	!	140			
	Phoresin	25	(f. 1/e)	3.98	3.8	3.70	3.65	3.49	3.32	3.15	3.10	3.03	3.02	2.96	
			tan 8	260	270	320	330	280	210	165	145	1/1	165	164	
	m. Alkyd resins														
	Chlorinated alkyd	8	61/E	!	!	1	8 9 6	1	:	1 1	!!!	!	1,179		
	diffecyanate, foamed		tan 8	}	į	1 1	1 1	!!!	1	1	1	! !	27		
ı	Alkyd, diisocyanate,	3	e'/e	1.223	1.223	1,223	1,223	1.218	1.205	1.20	\$ \$ 1	1.20	1.19		
	framed		tan 8	19.8	14.7	22.7	33.5	14	24	38	1	3#	25		
*	Red Glyptal #1201	52	e'/e _o	4.9	4.5	4.1	C. 4	3.9	3.8						
			tan S	92	009	200	004	320	280						

Values for tan 8 are multiplied by 10; frequency given in c/s.

I. Solids B. Organic 3. Plastics (cont.)

a. 38% polyester (Bakelite BR3-16631), 62% Fiberglas (Owens-Corning). b. Robertson. c. Echn and Haas. d. Shell Dev. e. Allyl resin (Southern Alkali Corp.) f. 40% resin, 60% ECC-11-148 Fiberglas (Southern Alkali Corp.). g. Diallyl phenyl phosphomate resin (Victor). h. Cornell Aeromautical Labs. k. Goodyear Aircraft. m. General Electric. *Frequency = 1x109,

H. S.	Solids B. Organic 3. Plastics (cont.)	tice (omt.)	Values for	tan S	are mult	are multiplied by	, 10 ¹	frequency	given in c/s.	n c/B.		
	eine	o E		عرابار	1+103	4017	501-1	9012	70141	801	80(*)	ور بې	010,-1
										OT T			2
	#51 Permo Potting	S)	e '/e	3.18	2.95	8°.	2.74	2.70	5.64	2.59	2.55*	2.53	2.52
	Compound		tan 8	730	410	260	174	124	101	120	182∗	125	122
	Glastic Grade GF ^b	25	e'/e _o	!!!	t t 2	:	!	3.76					
			ten 8	!		į	į	95					
	Glastic Grade MM	25	e'/€	4.17	4.13	60*1	4.02	3.96	3.88	3.78			
	1		tan 8	102	87	ಪೆ	8	115	125	136			
	Glastic Grade MP	25	£1/€	. !	; ! !	: !		3.56					
			tan 8	1 1	!	:	1	192		•			
	Glastic Grade A-2 ^b	25	e' /e _o	 1 	!	!		46.4					
			ten 8	-		!	!	518					
	Plaskon Alkyd Special	8 2	e'/e	5.32	5.10	96.4	φ . 4	92.4	4.65	4.55	4.54*	4.50	74.4
	Electrical Granular		tan 8	366	236	170	147	149	152	138	121*	108	138
	Plaskon Alkyd 411°	25	e'/e,	6.02	5.77	5.60	5.36	5.19	4.95	14.63	!	4.32	4.31
			tan 8	340	240	550	560	310	320	288	1 1 1	220	178
	Plaskon Alkyd 420°	22	e 1/e,	5.50	5.35	5.24	5.10	5.03	4. 90	4.82			
			tan 8	270	160	130	147	153	147	145			
	Plaskon Alkyd 422°	25	e'/e	5.47	5.26	5.14	5.01	4.92	4.85	17.4	4.75*	4.75	1,72
		٠.	tan 8	365	213	151	#CT	120	113	110	*001	104	126
	Plaskon Alkyd 440°	25	e1/e	5.13	5.04	4.95	4.85	4.73	4.61	4.50	*24°†	4.38	4.33
			tan 8	191	151	154	185	196	188	172	133*	137	146
	Plaskon Alkyd 440A°	25	e' /e	5.28	5.19	5.10	4.97	%**	4.78	4.65	4.63*	4.62	19.4
			tan 6	165	133	131	143	146	146	134	124*	141	149
	Plaskon Alkyd 442°	25	e'/e	5.02	4.89	4. 80	4.73	4.59	4.50	1 14.1	h-37*	ղ ջ• կ	4.29
			tan 8	212	189	140	141	146	142	122	127*	131	141
	n. Epoxy resins												
	Araldite Casting Resin	25	e'/e,	3.67	3.67	3.67	3.65	3.62	3.49	3.35	3.28	3.09	3.01
	Type B ^d		ten 8	17	1 72	20	110	190	270	340	3 1 0	270	550
	Araldite E-134 ^d	25	(E [®] /6)	7.3	6.1	5.3	L-4	₹. 4	t•4	3.7	3.5	3.2	3.1
			tan 6	1200	1050	80	760	011	1000	1300	750	760	390
	Araldite Cesting	25	e'/e	ħ.05	3.99	3,92	3.81	3.69	3.54	3.39	3.25*	3.15	3.10
	Resin G ^d		tan 8	105	104	141	210	270	288	300	311*	310	263

a. Hardman. b. Laminated Plastics. c. Libbey-Ovens-Ford. d. Ciba.

Values for tan 5 are multiplied by 10 ; frequency given in c/a .
I. Solids B. rganic 3. Plastics (cont.)

n. Epox. Resins (co.t.) Araldit Adhesive	0 to	£1/6,	12102	3.97	3.91	3.82	3.71	3.46	3.27	3:108	3.14	121010	2.511010
Type I Maturala		ten o	68	52	120	200	300	350	£ 0€	. !	230		
Araldite Adhesive	25	e1/e	9,11	9.11	11.5	11.3	0.11	10.5	10.2	6.6	9.6	9.5	
Type I Stlver		tan 6	38	8	120	190	300	370	360	360	58	980	
Hysol 6000 ^D	25	د ا/د	3.47	3.43	3•38	3.30	3.26	3.17	3,10	3.07	3.00	2.96	
		tan 8	73	61	2	8	130	170	170	150	120	120	-
Hysol 6020	25	e1/e	3.96	3.90	3.88	3.67	3.54	3.42	3.29	i	3.01	2.99	
		tan 8	89	113	506	560	272	566	299	;	475	252	
Hysol 6 30 flexible	52	€¹/€°	6.65	6.15	5.75	5.37	t12°t1	4.15	3.61	!	3.20	3.11	
Potting Compound		tan 8	605	1 85	694	593	0 1 8	1010	8	-	380	324	
Hysol 6000 PR	25	e,/e°	3.85	3.80	3.69	3.64	3.57	3.44	3•33	!	3.18	3.18	
		tan 8	8.	8	107	163	227	248	250	!	192	38	
Hy-tuf .eminate Grade	52	e'/e°	19.4	4.62	4.52	4.45	4.34	4.21	4.15				
GF181 ^b (field 1 laminate)	(e)	ten 8	ଝ	8	125	145	212	239	242				
(field ii laminate)	25	e,/e	!	i	-		1 ! !		!	*11.4	4.08	4.05	
		tan 8	1	:	.!			!		171*	177	180	
Epon Re : in RW-48°	22	e'/e _o	3.64	3.63	3.61	3.57	3.52	3.44	3.32	3.13*	3.04	2.91	
でいるのでは一般のできない。 という ない はい ない	40,	ten 8	ᄄ	38	89	111	142	191	564	220*	210	181	
o. Miscellaneous Plastics	ωı	,					•						
E Resin	63	e'/e°	2.49	2,49	2,48	2,48	2.47	2.45	2.45	1	2.43	24.5	
		ten 8	1	. ‡	س	۸ 5	€	80	8 0	1	9	5	
	8	e"/e°	2.5	2.5	2.5	2.5	2.5	2.45	2.45	1	4.0	 	
		ten 8	25	† T	80	1	. 4	9	2	1	15	17	
Same material after	8	ϵ ¹/ϵ _ο	5.56	5.56	2.55	2.54	2.54	2.54	2.53	נח תי	1 1	5.44	2.43
3 1/2 yrs. at room temp. and humidity	•	ten 8	ω	ส	16	19	ช	8	19	16	ŀ	-	ជ
Permat11 3256	42	€1/€	4.27	4.22	4.12	4.01	3.86	3.70	3.5	}	\$ \$ \$	3.1	3.0
,		ten 8	98	120	170	230	300	330	340	1	1	9L2	290
	66	e'/e	4.95	 8	4. ?;	19.4	84.4	4,28	4.05	\$!	3∙34	
		tan 8	500	155	160	88	300	0;11	570	1 1	1	580	
	125	ε¹/ε _ο	5.12	5.04	4.92	4.77	4.62	ጎ • ተ	1.4	1	1 1	3.38	
		tan 8	580	180	170	185	260	1,10	550	1	1 1 1	28	
Piccopale Resin	25	ε'/ε°	2.33	2,33	2.33	1	2.33	2.33	2,33	i .	2,30		·
		ten 8	× 3	6 ×	×	1	< V	ત	œ	-	3.5 5.5		,

a. Ciba. b. Houghton Labs. c. Shell Chem. d. Cross-linked addition hydrocarbon polymer (Esso Lab.), e. Cross-linked addition polymer (Gen. Elec.). f. Linear addition hydrocarbon copolymer made with aliphatic dienes and olefins (Penn. Industrial Chem.). Freq. = 1x109.

a. Matural Rubber	o H		12102	12103	1410	11105	1210	12107	12108	3x108	3109	121010	
Heves rubber	-12	e'/e,	7.5	4.5	†⁴. S	₩ . S	2.4		4.5				
		tan 8	10	1,1	1 78	#	55		33				
ř	25	e'/e	≒ •2	₹°2	ं वि•ेट	‡• ℃	₽•2	4.5	₹°2	1	2.15		
	٠.	ten 8	28	18	14	†ř	18	32	20	!	30		
	&	e'/e,	4.5	4.5	4.5	2,4	7.2		4.5			٠	
		tan 8	132	79	83	27	22	23	30				
Herea rubber,	27	£1/€	2.94	1 6°2	2.93	2.88	2.74	2.52	2,42	!	2.36		
vulcanized		tan 8	84	†∂	62	220	917	1,10	180	;	L †		
Heves rubber compound	27	e1/e0	60°†	10.4	3.%	3.80	3.64	3•₩	3.3	i	3.25		
		tan 8	130	155	188	230	308	405	592	1	148		
Heves rubber compound	27	¢1/¢°	E 3 6	36	27	14	0.6	7.0	6.8	!	6.3		
		ten 8		25000	12000	1,000	2500	1600	850	1 1	234		
Cellular Rubber	25	61/e ₀	1 1 1	1	į	1	1	1	1 1	1	1.31	1.31	
		tan 8	1	1	1 1	1 1	1	1	1	:	75	ま	
#49 Permo Potting	25	و،/و	3.46	3.39	3.28	3.18	2.96	8.80	2.72	2.63*	2.6		
$comound^{\mathbf{I}}$		tan &	169	230	274	320	370	350	215	170*	180		
b. Cutta-percha													
Gutta-percha ⁸	25	e1/e	2.61	2.60	2.58	2,55	2.53	2.50	2.47	2,45	2.40	2.38	
		tan 8	7	. #	6	ส	댗	&	120	110	જ	R	
c. Balata													
Balata, precipitated	52	e'/e	2.50	2.50	2.50	2.50	2.50	2.47	2,42	2,41	2.40	2.39	
		tan S	6	7	†	5	15	33	62	63	37	200	
d. Cyclized Rubbers							•						
Pliolite ¹	27	e¹/e°	2.5	2.5	2.5	2.5	מ ת'	2.5	2.45	1	₹°0		
*		tan 8	52	35	31	31	37	94	94	1	31		
Pliolite GR	22	e,/e°	2.6	5.6	5.6	2.55	2.55	2.55	1	1	1	ci .	
		tan 8	92	98	78	8	∄	33	i ! !	1 1	1	33	
a. Pale creps (Rubber Res. Corp.). b. 100 pts.	p.). b.	100 pts.	pale crepe,	ere, 6 pts.		sulfur (Rubber	r Res. C	Res. Corp.).	. 100 pt	c. 100 pts. pale crepe,	crepe,	1 pt. stearic	ric
acid, 10 pts. United Black, 5 pts. Kadox, 0.5 pts, Captax,	pts. Ka	dox, 0.5	pts, Cap	tax, 3 pts.		sulfur (Rubber Res. Corp.).	er Res.	Corp.).	d. 100	d. 100 pts. pale crepe,	edero e	, 1 pt. stearic	earte

Values for tan 8 are multiplied by 10; frequency given in c/s.

I. Solids, B. Organic 4. Blastomers

acid, 40 pts. United Black, 5 pts. Fedox, 1 pt. Captax, 3 Pts. sulfur (Rubber Res. Corp.). e. Cellular Rubber Prod. f. Depolymerized rubber (Hardman). g. Palaquium Oblongifolium (Hermann Weber). h. Minusops Globosa (Hermann Weber). 1. Goodysar. $\mathbf{Freq.} = 1 \times 10^9$.

	12,010				9°8	120							1 1.0	ß	2.77	8 4			1.37	38	1.27	16		2.35	တ	2.38	6.6	
	ر وم	3.76	047		8.9	180			2.45	∄			2.49	26	2.78	57	5.69	සි	1.38	39	1.28	17		2.35	6	2,38	9•3	
fn c/s.	عربي		i i i		3.0	410				1			1	1	\$ 6 8	1 1 1	2.70	114	1	1	1	1		1	i	1 1	i	
frequency given in c/s	80	17	1000		3.1	580		٠	2.45	r.	2.45	8	2,52	g	8.5	&	2.72	120	1.38	<u> 1</u> 4	1,29	19		2.35	10	2.39	임	
frequenc	70121	8 4	1900		3.3	0 1 /2	2,45	ያ	2,45	69	2.45	55	2.52	160	2.88	128	2.76	110	1,38	47	1.30	88		2.35	97	2,40	15	
by 10 ⁴ ;	901-1	6.3	2000		3.6	86	2.5	&	2.50	38	2.5	9	2.56	120	2.91	27	2.78	65	1.38	26	1.30	37		2,35	10	2.40	22	
Values for tan 8 are multiplied by 10 ^h ;	را ۰ ۱۳	7.9	98		4. 4	1700	2.5	85	2.5	18	2.5°	. #	2.65	8	2.93	700	2.81	33	1.38	IZ	1.30	36		2,36	13	2,40	38	
are mul	4014	9.5	850		6.2	2300	2.5	† ₹	2.5	91	2.5	.#	5,66	25	2.95	₹	8. 8.	56	1.39	R	1.31	8		2.37	27	2.41	58	
for ten 8	1+103	व	1900		8.9	3100	2.5	13	20 17	6	2.5	4	5.66	6	2.97	1 77	2.83	31	1.40	58	1.31	12		2.38	35	24.5	8	
Values i	عار ب ار	7.	7800		15.3	5200		1 1 1	2.5	9	1	!	5.66	2	2.98	97	2°8	8	1,41	115	1.31	1 7.		2.39	3 †	2,43	20	
cont.)	•	E'/E_	tan 8		@,/e°	ten 8	£1/€	tan 8	e'/e _o	tan S	e1/e	tan 8	e,/e°	tan 8	e'/e _o	ten 6	€1/€	tan 8	e1/e	tan 8	61/6	tan 6		€¹/ €°	tan 8	£1/€0	ten 8	
comers (o E	₹	÷		†₁7		-12		56		&		56		25		&		25		25			25		25		
I. Solids B. Organic 4. Elastomers (cont.)	d. Cyclized Rubbers	Plippend M-190-Ca		e. Buna Rubbers	Air seal b		GR-S (Buns S) uncured						GR-S (Buna S) compound		GR-S (Buns S) compound	BXG-117-G		•	Hycar OR Cell-tite		Marbon S, Buna S	${\tt Hardboard}^{m{\mathcal{E}}}$	f. Butyl Rubbers	GR-I (butyl rubber) ⁿ	•	GR-I compound ¹		
H	i .																											

(Rubber Res. Corp.). e. Ifur, Selanac, Altax, Methyl Tuads, zinc oxide, Akroflex, Heliozone, Cumar ME, stearic acid, Limestone, butadiene and 25% styrene (Rubber Res. Corp.). d. 100 pts. GR-S, 1 pt. stearic acid, 5 pts. Kadox, 5 pts. Captax, 3 pts. Sulfur 180butylene, 1-24 1soprane (Rubber Res. Corp.). 1. 100 pts. GR-I 44-7 M2K, 5 pts. zinc oxide (from ZnCO2), 1 pt. Tuads, 1.5 pts. a. Solution and suspension of thermosetting resins and valoanizable elastomers (Goodyear). b. Kearney. c. Copolymer of 75% Marbon S-1, etc. (Gen. Cable). f. Based on butadiene polymer (Sponge Rubber Prod.). g. U.S.Rubber. h. Copolymer of 98-99 sulfur (Rubber Res. Corp.).

I. Solids, B. Organic 4. Elastomers (cont.) Values for tan 8 are multiplied by 10, frequency given in c/s.

2.5*1010											ě.			,,										<i>‡</i>	250	*.	
111010	2.70	130	2.70	110	29.6	65	2.72	1,40	2.63	100	3.03	190			1,11	36			1.15	33				۰ ۱	261	011*1	700
32109	8.8	180	2.76	160	5.66	93	2.8	210	2.70	150	3.13	200			1.15	26			1.15	32	-	2.84	2 4	00°‡	339	04.4	96
3x108	2.85*	\$0₹2	2,83*	220*	2,68*	130*	2.88*	300*	2.80*	190*	3.18*	\$60*			1,18*	54*			1.15*	*01		! ! !	!	42°4	989	4.73	1200
1x108	3,00	26	2.91	06 1 1	2.78	270	2,98	760	2.87	091		1			· :	1			;	1 1 1		₹•€	1600	4.5	936	5.2	930
12107	3.30	1050	3.15	046	8.9	550	3.38	1300	3.11	86	3.62	8				!			į	-		7.4	2000	5.54	1190	5.65	320
901मा	4.00	1100	3.78	86	3.20	530	4.05	720	3.61	046	14.4	1080	1.15	184	!	1	1.14	143	1	!		5.7	950	92.9	380	5.75	93
14105	야 1	530	4.20	864	3.44	260	4.29	530	00°†	아	18.4	590	1.20	240	:	!	1.16	162	:	1		6.1	300	24.9	150	5.86	8
1410	4.70	180	4.35	160	3.51	&	h.36	102	4.15	120	5.12	250	1.25	150	!	1 1 1	1.19	141	1			6.2	330	45.5	115	% 9	140
1103	4.75	130	4.45	96	3.54	52	₹ ₹	22	4.20	65	5.20	165	1.26	108	i	!	1,22	11	;			6.5	860	9.50	110	6.20	430
न्ग0	% *	580	84.4	130	3.54	105	ታ• ቱ	102	02.4	140	5,41	320	1.28	175		1	1.23	157	!	}		7.5	0009	02.9	160	6.70	2700
	e'/e	tan 8	e'/e	ten 8	£1/€	tan 8	e1/e	ten 8	e'/e ₀	tan 8	e'/e _o	ten S	25 e'/e,	tan 8	e1/e0	tan 6	£1/6	tan 8	e'/e	ten 8		e1/e	tan 8	e'/e	tan 8	e'/e	tan 3
o _E	25		25	•	25		25		25		25				10) 25		o b 25	€	le) 25			56		45		&	
4. Mitrile Rubbers	Kralastic BE Natural		Kralastic BM Natural		Kralastic D Natural		Kralastic EBMU Natural		Kralustic F Natural		Royalite 149-11 ^b		Expanded Royalite M21982-1	(field L plane of sample)	(field II plane of sample)		Expanded Royalite M22190	(field L plane of sample)	(field ii plans of sample)		h. Neoprene	Meoprene Ga	•	Meoprene compound			

with tetracthylthiuran disulfide (Du Pont), d. 38% GM, 28.4% Catalpo Clay, 14% blanc fixe, 0.4% Gaster (carbon black), 1.9% paraffin, a. Maugatuck. b. Polystyrene-acrylonitrile r. 4 polybutadiene-acrylonitrile (U.S.Rubber). c. Poly-2-chlorobutadiene-1,3 stabilized 3.36 Circo (light process oil), 0.2% stearic acid, 0.8% Neozone A, 0.4% Parazone, 7.6% lithange (DuPont). *Freq. = lxlo.

																-	74	_								
	2.5x1010	13.6	1000																							
	111010	† <u>†</u>	1500	મ ∙ 8	5200	8.5	0001	٠	5.72	510			5.0	8	2.85	167	9. 7	1400				350	3.09	174	3.00	500
	31109	16	2200	17.1	2300	14.8	3600		5.73	254	t-	430	5.0	01/1	2.90	100	7.8	909	8	360	4.5	170	3.11	100	3.02	190
in c/8.	34108	₹ 2	2800	20.5*	2600*	17*	3000*		5.74	52	1 1 1	!	5.0	250	2.93*	\$65	7.9	310	!	;	4.5	26	3.16	36	3.04	∄
frequency given	11108	30	5800	! ! !	!	i	: ! !		5.75	27	6.8	33	5.0	230	2.95	R	8.0	310	8.5	16	4.5	35	3.18	53	3.05	58
frequen	12107	2	3200	901	27000	8	7600		5.75	75	6.9	14	5.09	580	2.95	10.4	₽.8	270	8.5	13	4.52	23	3.19	28	3.07	65
by 10 ⁴ ;	30171	011	3900	740	00001	215	18000		5.73	80	6.9	75	5.39	270	2.95	7.5	8.8	250	8.5	11	4.53	30	3.20	37	3.10	150
8 are multiplied by 10	12105	200	5100	7550	88000	000	36000		5.75	10	7.0	13	5.61	500	2.95	3.5	0.6	3,5	8.5	검	4.53	<u></u>	3,23	58	3,16	106
S are mu	40[H								5.75	16	0.	18	5.79	108	2.95	4	9.5	8	8.6	19	4.56	춨	3.26	69	3.17	69
for ten	1103	2260	12900	17900	36300	17300	10000		5.76	30	7.1	56	5.85	<u>9</u>	2.95	5.2	75.6	31	8.6	32	4.60	63	3.30	29	3,18	30
Values	11102	!	!	1 1	!	:	£		5.78	เร	7.1	3	5.87	143	5.96	5.8	9.32	Ł †	8.6	52	99.4	29	3.36	85	3.19	22
(cont.)		e'/e	ten 8	e'/e	tan 8	e'/e	tan 8		£1/6°	ten 8	e1/e,	tan 8	e1/e	ten 8	e,/e°	tan 8	e./eº	tan 8	e'/e _o	tan 8	e'/e _o	tan ô	e'/e _o	tan 8	€¹/€°	tan 8
stomers	O _E	23		25		2 <u>5</u>			25		25		25		25	. (શ		25		25		25		25	
I. Solids B. Organic 4. Elastomers (cont.)	1. Thickel	Thickol, Type FA	e ompound	Thickol PRI	q punodimoo	Thickol ST	punodmon	J. Silicone Rubbers	Silestic 120 ^d	•	Silastic 125 ^d		Silastic 150°	•	Silastic 152 ¹		Silastic 160 ⁸	٤	Silastic 167^{11}	•	Silastic 180 ²	•	Silastic 181		Silastic 250 ^K	

diphenylguanidine, 0.35 pt. Altax (Thiokol). b. 100 pts. polysulfide copolymer of bis (2-chlorosthyl) formal and sthylene dichloride, a. 100 pts. Thickol (organic polysulfide), 10 pts. zinc oxide, 60 pts. semi-reinforcing carbon black, 1 pt. stearic acid, 0.5 pt. 60 pts. carbon blacks, compounding ingredients. (Thickel). c. 100 pts. polysulfide polymer of bis (2-chlorethyl) formel, 60 pts. 35% ZnO, 30% CaCO3. (Dow Corning). f. Dow Corning. g. 33% siloxane elastomer, 33% ZnO, 33% TiO2 (Dow Corning). h. 33% siloxana carhon blacks, compounding ingredients. (Thiokol). d. 50% siloxane elastomer, 50% TiO2 (Dow Corning). e. 35% siloxane elastomer, elastomer, 675 T102 (Dow Corning). 1.35% siloxane elastomer, 35% SiO2, 30% TiO2 (Dow Corning). 1.45% siloxane elastomer, 55% SIO2 (Dow Corning). k. 70% siloxane elastomer, 30% SiO2 (Dow Corning). *Freq. = 1x109.

I. Solids, B. Organic 4. Elastomers (cont.) Values for tan 8 are multiplied by 104; frequency given in c/s.

121010	3.00	110	27	1000	3.20	160	3.00	213	3.15	170	2.88	183	2.94	180	2.94	195	3.08	146							•		
32109	3.08	&	91	0 / 20	3.23	88	3.01	मेंपर	02°5	52	2.97	158	3.02	96	3.00	143	3.13	16	•	5.6	8.	8.6	115	2.86	25%	3,45	735
3x108	3.08	35	10	55	3.25	36	3.08	1	3.28	53	3.00*	44℃	3.05*	57*	3.02*	*118	3.15*	*69		5.6	88	2.65	110	! !	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1	
11108	3.11	23	10	27	3.27	32	3.08	29	3.31	24	3.05	33	3.07	83	3.06	31	3.16	35		1	. !	i	:	3.10	300	3.8	700
12107	3.12	8	10	07	3.30	34	3.08	23	3.31	53	3.06	17	3.09	15	3.08	16	3.18	27		2.65	89	2.75	93	3.26	350	00° 1	540
12106	3.14	53	10	9.5	3.31	57	3.10	37	3.33	53	3.07	11	3.10	12	3.10	9.5	3.20	30		2.65	26	2.8	20	3.47	310	4.33	004
1x10 ⁵	3.16	84	10	13	3.35	100	3.12	53	3.37	97	3.08	7	3.10	ક્ષ	3.10	7	3.55	94		2.7	£ 1 1	2.8	<u>유</u>	3.66	225	4.60	094
1x10	3.16	8	10.0	17	3.42	190	3.12	31	3.45	190	3.08	5.3	3.11	1 1	3,10	6.5	3.25	58		2.7	31	2.85	ß	3.75	128	5.10	650
11103	3.18	₹	10.1	56	3.53	250	3.12	19	3.55	250	3.08	7.2	3.12	54	3.12	7.8	3.35	67		2.7	18	2.83 83	19	3.81	4 L	5.65	98
12102	3.22	51	10.1	1 4	3.66	500	3.21	58	3.72	210	3.09	16	3.14	56	3.14	13	3,40	#9 ***		2.7	12.5	2.85	†∂	3.86	65	6.50	1050
	61/6	tan S	61/6	tan S	£1/E	tan 8	e'/e_	tan 8	£1/E	tan S	3/,3	tan 8	£1/€	tan 3	e"/e	tan 8	E1/6	tan 8		£1/E	tan 3	E'/E	tan 8	£1/E	tan 3	£1/€	tan 8
о Н	25		52		25	•	25	•	25		25	,	25	•	25		25			25		&		28		. 02	
J. Silicone Rubbers	Stlastic X43428		941e=+1c 6167b		841satte 61816		Stlastic X-6734d		Silestic 7181°		SE-450		STE-1609	<u>.</u>	SE-550 [®]		9272-328		5. Natural Regins	Amber				Shellac, natural XI			

57% S102 (Dow Corning). d. 70% siloxane elastomer, 30% S102 (Dow Corning). e. General Electric. f. Fossil resin (Amber Mines). a. 50% silorene slastomir, 50% SiO₂ (Dow Corning). b. 33% siloxane elastomer, 67% TiO₂ (Dow Corning). c. 45% siloxene elastomer, g. Contains ca. 3.7% war (Zinsser). *Freq. = 1x109.

I. Solids B. Organic (Cont.) Values for ten 5 are multiplied by 104; frequency given in c/s.

2.5x1010													•					पृत्त o	· ·	21					:	
121010							2.87	120		2.55	9.3	2) 1,5	12			2.35	6.8	ς π	C+.7	19	•					
32109	2.86	230	2.94	270	2.75	<i>2</i> 92	2.8	135		!!!!	!	0 برئ	11	2.96	210	2.40	7.8	: 4	v.	15	2.45	223	2,62	16		
3:408	1	:	!	!	!	!	2.91	125		!	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	!	1	t 	: ! !	1 1	:		!	1	!	1	ł !	1 1 1	-	
12108	3.1	345	3.2	340	3.05	310	2.98	118		2.56	נו	79.5	77	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1	2.1.7	15		2.52	15	;	!	!	1		
1x107	3.30	341	3.32	347	3.20	317	2.98	110		2.57	13	5.64	10	3.13	272	2,48	22.2		2.53	15	2,46	130	2.63	19	2.79	6 1
1x106	3.50	313	3.50	304	3.30	285	3.00	100		2.58	16	2.64	11	3.23	240	84.5	25.5	•	0.7 4.	8	2,50	3.80	2,63	25	2.82	110
11105	3.66	250	3.69	205	3.40	205	3.04	16		2.61	19	2.64	1 1	3.37	240	2.48	25.9		2,55	30	2.63	560	5.64	39	2,88	210
1410	3.75	132	æ.€	131	3.48	118	3.09	88		2.63	25	2.65	56	3.55	275	2,18	28.9		2.57	145	3.5	3500	2,66	2	2.97	310
11103	3.8	₹	3.92	102	3.56	75	3.12	8		5.66	35	2.65	35	3.75	335	8 ⁴ .5	35.5		2.58	89	5.0	2000	5.69	120	3.14	1,20
11102	₩. 8.	58	3.99	137	3.60	58	3,19	105		2,68	58	2,65	39	3.90	452	2.48	43.9		2.60	157		!	2.75	186	3.29	1,50
	e''/e	tan S	£1/E	ten 8	e1/e	ten 8	e'/e.	ten 3		e'/e	tan 8	e1/e	ten S	£1/€	tan 3	e'/e	ten 8		£1/e	tan 8	e¹/e¸	tan 8	e1/e	ten 8	e 1/e	tan b
T°C	27	•	28		56		23			56		22		23		25			54		89		22		02	
5. Natural Resins	Sheller natural	7116	Shallac numa C	parmet.	Shallac garnet	dewred	Chemlac B-3		6. Asphalts and Coments	Gilsonite		Millimar		Cenco Sealstix ⁸		Plicene Cement		7. Waxee	Acrawax C ¹				Apiezon Wax "w"J			

e. Contains ca. 3.5% wax (Zinsser). b. Matural, ca. 2% wax (Zinsser). c. Matural, wax-free (Zinsser). d. From zein and rosin (Fillered Rosin Products). e. 99.9% natural bitumen (U.S.Rubber). f. Asphaltic product (U.S.Rubber). g. De Khotinsky Cement (Central Scientific). h. Central Scientific. i. Cetylacetamide (Glyco). j. Shell Oil.

	3x109 1x10 ¹⁰ 2.5x10 ¹⁰	2.35 2.35	50 48	2,31	216		75 62	2.29 2.27		2.28 2.27	•	2.25				2.25		2,29 2,28 2,28				Š	2,92 2,36 2,34	583 296 200	2.57	אסיו
	3×108		į			1	1	1 1 1	i	-	1	!	!	1 1	!	3	1 1 1	2,30	ρ.3	2,15	6.4		3.46	1620	3,17	7.60
. с/в.	12108	2.39	8	2.34	125	2,42	8	1		1	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	2.27	מי	2.3	<i>=</i> †	2.25	#	2,30	2.5	2,18	5	-	વ્	2700	3.37	5
given in	70121	2,41	68	2.36	58	2,45	₽	2.32	7	2.32	or	2.28	7	2.3	4	2.25	5	2,30	4	2.18	. † ∨		5.30	450	3.62	
dneucy 6	11106	2,43	₽	2.39	35	64.5	35	2,33	80	2,33	∞	2.28	77	2.3	†	2.25	7	2.30	<u>ι</u>	2,13	∙ <i>α</i> ι ∨	•	5.0	45	3.70	Ċ
101; frequency given in	1x10 ⁵	2.48	190	2.43	25	2.53	150	2.34	8	2,34	7	2,28	13	2.3	5	2.25	7	2.39	. †	2.18	⊗ ∨		5.₹	6 0	3.74	0
8 are multiplied by	1-10	2.56	566	2,46	25	2.59	2 ¹ / ₁ 0	2.35	7	2.35	٣	2,28	10	2.3	70	2.25	ſŲ	2.30	ณ	2.18	ش		Ŏ. ₹5	7	3.76	٧
re multi	हुलमा	2.63	118	2.50	\$	5.66	0 1 1	2.35	9	2.35	۲ ۲	2,28	5	2.3	9	2.25	.	2,30	cı V	2.18	2	•	5.45	17	3.78	a
tan 8 a	14102	2.65	140	2.52	8	2.73	240	2.35	ľ	2.35	< 5	i : :	-	2.3	œ	1	1	2.30	7	2,13	11	. 1	5.45	18	3.78	7,
alues for		e,/e	tan 6	e¹/€	tan 8	e'/e	tan 6	€1/€	tan 6	e1/e	tan 8	e1/e	tan 8	e 1/e	tan 6	e'/e	tan 8	e'/e	tan S	e1/e	tan 3	:	و ا/ و و	tan S	و،/د	+
(cont.) Values for tan	OFF	23		55		23		*†Z		*9t		SS SS		25		50		25		&			56		25	:
I. Solids B. Organic	7. Wares (cont.)	Beeswar, white				Beeswar, yellow		Cerese Wax AA				Cerese Wax, brown	•	Ceresin, white		Ceresin, yellow	•	Estavax ^I				Halowax #10018	cora-moraea		hot-molded	

e. Vegetable and mineral waxes (Mitchell-Rand). f. Long-chain, singly unsaturated (Lovell). g. Tri- and tetrachloromaphthalenes a. Bromund. b. Candy. c. Mainly petroleum aliphatic hydrocarbons (Socony-Vacuum). d. Vegetable and mineral wares (Kuhne-Libby). (Bakelite).

*Similar data were obtained after incorporation of 0.5% phenyl mercuric stearate.

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Figure F	(+000/ 0001	o E		201-1	501-1			_	00	α		ç	,
## ## ## ## ## ## ## ## ## ## ## ## ##	Control and	2	,				_	_	20	310		011	2.5x10.10
## 1	x #11-314~	g	e'/e _o	3.11	3°0°	2.99			2.93	2.92		2.87	
#5 e'/e, 3.11 3.04 3.01 2.99 2.96 2.96 2.93 tan 6 700 110 17 5 3 3 5 tan 6 700 110 17 5 3 3 5 e'/e, 3.01 2.97 2.91 2.75 2.52 2.35 2.25 2.35 2.26 2.98 e'/e, 3.02 2.90 2.90 2700 1450 260 200 200 200 #14 e'/e, 13.2 10.3 7.0 4.3 3.2 2.9 2.9 2.7 2.55 tan 6 13.2 10.3 7.0 1450 260 200 200 200 200 #15 e'/e, 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.2			tan 8	700	110	ľΩ			17	38		9.5	
tan 6 700 110 17 5 3 3 5		5	e1/e	3.11	3.04	2.99			2.93	! ! !		2.87	
##150° 25 e'/e° 3.01 2.97 2.91 2.75 2.52 2.35 2.25 2.24 2.33 tm 6	د		tan 8	700	110	ŗ			ιC	!		31	
	Wax #150°	25	e'/e	3.01	2.97	2.75			2.25	2.24		2.22	
12 12 10.3 7.0 4.3 3.2 2.9 2.7 2.55 12 12 12 11.4 8.2 5.4 3.7 3.0 2.7 167 12 12 11.4 8.2 5.4 3.7 3.0 2.7 167 12 13 13 260 300 2100 860 430 167 13 13 2.26			tan 8	83	93	510			270	218		8	
Harror H	อัษ	†∂	e'/e	13.2	10.3	4.3			2.7			2.52	S.
Fig. File			ten 8	1250	2100	2700			270	!		160	160
tan b 150 2600 3000 2100 860 430		2 4	e¹/eº	14.2	11.4	5.4			2.7	!		2,47	
tan 5			tan 6	450	1300	3000			1430	:		236	
wax 132° ASTM³ 25 e.'/e 2.25	nte	89	e 1/e	2.26	2,26	2,26			2.26	! !			
Max 132 ASTM 32 ASTM 32 S (*) & 2.25 C 2.2			tan S	9.	9	10			9	!			
### First State Composition 25	fin Wax 132° ASTM	25	e'/e ₀	2.25	2.25	2.25			2.25	1		2.24	2.2
## ## ## ## ## ## ## ## ## ## ## ## ##			tan 8	0 V	ณ V	0 ∨			∾ ∨	1		2,1	۳ ۷
Hear 135° AMP ^f 24h e'/e, 2.25 1.2 5 < 2 < 2 < 3 5.2 Hear 135° AMP ^f 24h e'/e, 2.25 <td></td> <td>87</td> <td>€¹/€°</td> <td>2.02</td> <td>2.02</td> <td>2.02</td> <td></td> <td></td> <td>1</td> <td>1</td> <td></td> <td></td> <td></td>		87	€¹/€°	2.02	2.02	2.02			1	1			
Hear 135° Angr's 24 e'/e, 2.25 2.25 2.25 2.25 2.25 2.25 2.22 tan 5 12.5	9.		tan 8	ī	1.2	8 V			!	1			
tan 6 12.5 < 5.5 < 2 < 4 1. \\ \begin{align*}{c c c c c c c c c c c c c c c c c c c	in Wex 135° AMP	5 †	e¹/e	2.25	2.25	2.25			1 1	- 1		2.22	
20 e'/e, 2.25 2.25 2.25 2.25 2.25 2.25 2.25	ŧ		tan 8	12.5	5.5	۷ ۷			!	! !		a	
tan 5 2 2 2 3 3 1.4 1 2 2	8 _H	80	e'/e _o	;	2.25	2.25			2.25	2.25		2.25	
25 e'/e, 2.89 2.87 2.87 2.85 2.84 2.80 2.72 2.62* 2.59 tan 8 67 44 36 43 82 166 240 180* 195 tan 5 249 150 99 79 80 100 120 122 tan 5 122 106 87 60 44 32 28 122 stic Composition 25 e'/e, 2.65 2.60 2.57 2.56 2.55 2.54 2.52* 2.52* 2.52 tan 6 112 91 67 41 25 16 15 13 13 13 13 13 13 13 13 13 13	.2.		tan 8		CV.	ณ			1.4	H		2.5	
tan 8 67 44 36 43 82 166 240 180* 195 e'/e, 3.68 3.52 3.40 3.32 3.29 3.27 3.2 3.09 tan 5 249 150 99 79 80 100 120 122 e'/e, 3.77 3.72 3.68 3.63 3.60 3.58 3.56 122 tan 5 122 106 87 60 44 32 28 122 e'/e, 2.65 2.60 2.57 2.56 2.55 2.54 2.54 2.5* 2.52 tan 6 112 91 67 41 25 16 15 13* 13* 13	1.1	52	e1/e	2.89	2.87	2.85			2.72	2.62*		2.58	
e'/e ₀ 3.68 3.52 3.40 3.32 3.29 3.27 3.2 3.09 tan b 249 150 99 79 80 100 120 122 e'/e ₀ 3.77 3.72 3.68 3.63 3.50 3.56 122 tan b 122 106 87 60 44 32 28 e'/e ₀ 2.65 2.50 2.57 2.56 2.55 2.54 2.52* 2.52* tan b 112 91 67 41 25 16 15 13* 13			tan 8	<i>L</i> 9	‡	£ 1			240	180*		199	
tan 5 249 150 99 79 80 100 120 122 e^{1}/ϵ_{0} 3.77 3.72 3.68 3.63 3.60 3.58 3.56 122 tan 5 122 106 87 60 44 32 28 e^{1}/ϵ_{0} 2.65 2.60 2.57 2.56 2.55 2.54 2.54 2.52* 2.52 tan 8 112 91 67 41 25 16 15 13* 13	g war, Red	52	e'/e ₀	3.68	3.52	3.32			3.2	1			
e'/e _o 3.77 3.72 3.68 3.63 3.60 3.58 3.56 tan b 122 106 87 60 44 32 28 e'/e _o 2.65 2.60 2.57 2.56 2.55 2.54 2.54 2.52* 2.52 tan b 112 91 67 41 25 16 15 13* 13	. ss		tan 8	546	150	62			120	į			
ten 5 122 106 87 60 44 32 28 ten 5 112 91 67 41 25 16 15 13* 13	plastic Composition	52	e'/e _o	3.77	3.72	3.63			3.56	:	;	3.58	
€'/€ ₀ 2.65 2.60 2.57 2.56 2.55 2.54 2.54 2.52* 2.52 ten 8 112 91 67 41 25 16 15 13* 13			tan S	122	106	8			28	1	1	ୟ	
tean 8 112 91 67 41 25 16 15 13* 13	plastic Composition	52	د، /د٥	2.65	2.60	2.56			2.54	2.52*	2.52	2.49	
			ten 8	112	16	돠			15	13*	13	13	

(DuPont). d. Natural paraffin (Allison). e. Mainly C₂₂ to C₂₉ alliphatic, saturated hydrocarbons (Stand. 011 N.J.). f. Gulf. g. Raraffin vax (Socony Vacuum). h. Lovell. 1. Dennison. j. Mitchell-Rand. a. 80% 1,4-, 10% 1,5-, 10% 1,2-dichloromapthalenes (Bakelite). b. Polychlorotrifluoroethylene (Kellogg). c. Mainly 12-hydroxystearin

I. Solids B. Organic (cont.)		Values for tan	ø	are multiplied by		10"; frequency gi	quency &	ven in	c/a.	. •	,		,
7 Veres (cont.)	o F		12102	1x103		12105	1x106	12107	1x10 ⁸	3x108	3200	111010	2.5x1010
mpositia	33	e'/e	18° 2	2.79		2.64	2.59	2.54	2.51	2.48	2.45	2,45	
3767A	ı	tan 6	140	160		120	98	78	69	59	32	27	
Vistavex	3	e1/e	2.34	2.34		2.34	2.34	2.32	2.30	:	2.27	2,26	
	ı	tan 8	Q	٣		12.1	13.3	13.6	13.3	1 1	0.6	77	
Wex 3760 ^c	25	61/6	2,36	2.36		2,36	2.36	2.36	2.36	2.31*	2.31	2,31	
	•	ten 8	21.7	8.8		5.6	14.3	2.7	2.6	3.6*	6.4	14.2	
Wax 9-1167 ^d	3	e'/e	19.9	10.2		4.1	3.3	3.1	2.9	5.6	5.6	5.6	
•		tan 8	7200	3900		1700	1000	009	024	300	190	8	
Wax S-1184d	25	£1/€	2.43	2.43		2,40	2.40	2.40	2.37	2.34*	2.30	2.21	
	•	tan S	4.62	21.5		16.4	11.3	9.3	13.8	50*	1 2	5.	
Wex Compound F-590	56	81/6	2.37	2.34		2.32	2.32	2.32	2.32	;	2.32		
		tan 8	&	8		#	8	80	5	! ! !	6.2		
Wax Compound #1340	56	e1/e	2.30	2.30		2,30	2.30	2,30	2.30	i	2.25		
		tan 6	H	α		۸ ر	#	4	=	! ! !	₹.5		
8. Woods										-			
Balsa	56	e1/e	₽. L	1°1	1.4	1.4	1.37	1.35	1.30	l - -	1.22	1.20	
		tan 8	R	뎣	£ 1	11	120	135	135	:	100	83	
Yellow Birch	35	e'/e	2.91	2.88	8.8	2.78	2.70	2.60	2.47	2,40	2,13	1.95	1.37
(field L to grain)		ten o	72	8	1. St	220	330	360	00 1	330	330	280	560
Fir, Douglas	22	#1/E	2.04	2.00	1.97	1.95	1.93	1.8	1,88	1.86	1.82	1.80	1.78
(field 1 to grain)		tan 5	84	&	130	18	260	310	330	320	270	290	320
Fir, Douglas, plywood	25	q1/e	2,1	2.1	2.05	1,95	1.9	1.8	!!!	1.7	1	!	1.5
(field L to grain)		tan 8	115	105	130	170	230	320	!	360	1	:	550
Fir, Douglas, staytek	25	£1/€	7.3	7.05	6.9	6,65	6.3	5.6	9.4	0.4	3.5	რ ლ	လ္ က ်
(field i to grain)		tan 8	8	130	800	320	<u>%</u>	750	8	850	700	550	09†
Mahogany	35	e'/e	24.5	2,40	2.36	2.30	2.25	2.17	2.07	2.01	1.88	1.7	1.6
(field L to grain)		tan o	8	120	150	195	K)	310	320	300	250	210	500
Poplar, yellow	£	e1/e	1.84	1.79	1.78	1.76	1.75	1.70	1 1	1.60	1.50	1.42	٦. ب
(field L to grain)		tan S	Z ¹	54	83	133	190	250	1	200	150	800	170
		•			,	ı	,						

Values for tan 8 are multiplied by 10^{4} ; frequency given in c/s.

a. Mitchell-Rand. b. Polybutene (Cantol Wax). c. Mitchell-Rand. d. Glyco. e. Zophar Mills. *Freq. = 1x109.

유 1														
2.510					÷						15	7000	4.5	500
141017	29.5	1 03	2.84	827							30	3700	0. ñ.	200
									2,96	1765	<u>알</u>	3000	2.5	200
3210	2.75	099	3.00	720					!	-	ß	7800	2.5	1200
भग0	2.77	099	3.08	630	3.1	380	4.5	1000	8 1 1	!	!	:	2.6	1500
12107	2.86	570	3.14	Of t	3.1	300	4.9	1000	1 1	!	50	00009	4.5	9300
901मा	5.99	380	3.31	230	3.2	582 582	5.6	1400	1	!!!	197	610000 2	† τ	17000
1100	3,10	500	3.40	85	3.4	580	6.9	2200	1	į	!	!	: : :	1
† 0121	3.22	117	3.49	61	3.6	300	9.3	3700	1	1	24400	105000	210	25000
11103	3.29	11	3.52	47	3.9	350	14.0	7000	! !	!	1	! !	750	30000
1x10 ²	3.30	58	3.57	170	4.1	450	38	14000	t 1 1	1	1	-	!	! ! !
	e1/e	tan S	e¹/e,	tan S	e¹/ဧ°	tan 8	e1/e	tan 8	e,/e°	tan S	e'/e _o	tan 8	e,/e°	tan 8
T _o L	25		85		25		25		52		25		52	
9. Miscellaneous	Paper, Royalgrey				Leather, sole, dried		Leather, sole, ca.	15% moisture	Soap, Ivory		Steak (bottom round)		Suet	
	TO 1x10 ² 1x10 ³ 1x10 ⁴ 1x10 ⁵ 1x10 ⁶ 1x10 ⁷ 1x10 ⁸ 3x10 ³ 3x10 ⁹	$\frac{\pi^0 c}{25} \frac{1 \times 10^2}{6} \frac{1 \times 10^3}{3.30} \frac{1 \times 10^3}{3.29} \frac{1 \times 10^5}{3.22} \frac{1 \times 10^6}{3.10} \frac{1 \times 10^7}{2.99} \frac{1 \times 10^8}{2.86} \frac{3 \times 10^9}{2.77} \frac{3 \times 10^9}{2.70} \frac{1 \times 10^{10}}{2.62}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1.0° 1.0° 1.0° 1.0° 1.0° 1.0° 1.0° 1.0°									

a. Rogers. b. Procter and Gamble.

COUNTY	given in c/s.
H	#
II.	garen
	frequency
	*°
	P.
	are multiplied by 104
	ar.
	0
	tan
	for tan
	Values

Values for tan 5 are multiplied by 10	BO DY TO	J; frequency give	ren in c/s.							
A. Inorganic	o _{El}		म्)TIO	11107	11108	3x108	2	121010	2.5x1010**
Water, conductivity	1.5	e'/e _o	87.0	87.0	87	87	86.5		38	15
			1900	190	50	20	350		10300	4250
	L	£1/€0	!	85.5	! !	!	85.2		1	17.5
		tan 8	!	220	!	!	273		9500	3950
•	15	e,/e _o	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	81.7	!	:	81.0		64	25
		ten 8	1 2 2 2	310	!		210		7000	3300
	52	e¹/e0	78.2	78.2	78.2	78	77.5		55	3,5
		tan 8	1000	004	94	52	160		5400	2650
	35	e¹/ဧ _o		74.8	1	!	74.0		58	14
		tan S	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	485	1	!	125		001/4	2150
	¥2	e'/e ₀		71.5	!	1	71.0		59	94
		tan 8	•	230	!	!!!!	105		0004	2750
	55	e¹/eº	!	68.2	8 8	!	89		8	64
		ten 8	1 1 1	720	1	:	8		3600	2450
	65	e'/e _o	1	8.49	1 1 1	:	64.5		59	50.5
		ten S	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	865			ౙ		3200	1250
	22	e'/e _o	!	61.5	! ! !	1	61		23	51.5
		tan 8	1	1030	1	1	11		2800	1050
	82	e'/e _o	58	58	58	58	57		<u>*</u>	
		tan 6	12400	1240	125	30	73		5600	
	95	e'/e _o		55			52			
		tan 8	:	1430	!	1	20	024		
Aqueous sodium chicride										
0.1 molal solution	25	e'/e _o	7/8,2*		. I	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	92	75.5	太	
		tan 8	24,000,000	!!!!	1 1	1	7800	2400	5600	٠
0.3 molal solution	25	e'/e _o	78.2*	! ! !	! !	! !	17	69.3	52	
		tan S	63,000,000] []	1	1 1 1	24000	4350	6050	
0.5 molal solution	25	e'/e ₀	78.2*	1	1	1	69	0.79	51	
;		tan 6	000,000,66	1 1 1	1 1 1	!	39000	6250	6300	
0.7 molal solution	25	e*/e ₀	78.2*	7	! !	1	1	:	ደ	
		tan 6	130,000,000] 1 1	!	2		1 4 8 8	0099	
Despend Talamatan		•					-			

a. Research Laboratory of Physical Chemistry, M.I.T. b. MaCl, Mallinckrodt's Analytical Reagent.

*. ϵ'/ϵ_0 of conductivity water assumed for nurpose of calculating tan 5 from conductivity measurements.

** Data of Collie, Hasted and Ritson, Proc. Phys. Soc. 60, 145 (1948).

II. Liquids B. Organic Val	Values for	ten 5 er	e multi	lied by	10 ⁴ ; freq	tan 5 are multiplied by $10^{\frac{1}{3}}$; frequency given in c/s.	ven in c	.8				
1. Aliphatic	Toc		र्णम	14103	40171	र्णम	90मा	12107	801H	32108		11010
Heptane a	25	e¹/e,	1.971	1.971	1.971	1		1	1 1 1	1.97		1.97
		tan 8	۸ س	ᡮ ° 0∨	₹*0>	t 1 1	E E B	! ! !	1 1 1	< 2.5		16
Methyl alcohol ^b	25	£1/60	;	1 1 6	!!	1	31	31.0	31.0	30.9		8.9
		ten 8	1	1	! ! !	1 1	2000	260	380	800		8100
Ethyl alcohe 1	. 52	£1/€	i,	1	1	1	24.5	24.1	23.7	22,3		1.7
•		tan 8	1	1	1		8	330	620	2700		680
n-Propyl alcohol	25	e'/e _o		: : :	1 1 1	1 1 1	20.1	20.1	19.0	16.0		2.3
•		tan 8	1	!	!	!!!!	180	170	2000	1,200		006
n-Butyl alcohol	25	e1/e0	1	1	1	17.4	4.7.	17.4	14.3	11.5	3. 1.	
		tan 8	!	:	12000	1000	95	240	2700	5500	4700	
Ethylene Glycol	25	e1/e	:	i	얼	141	다	14	14	39	12	7
		tan 8	-	1	30000	3000	300	&	450	1600	10000	7800
Butyraldehyde	23	¢,/€°	1	6.7	6.7	1 1	6.7				4	٠
	٠	tan ô	-	51000	5200	† †	50					
Dibutyl sebacate	56	e1/e	4.92	4.73	4.63	7.60	4.58	4.56	!	4.55	3.8	
٩		tan S	79	110	*†	က	m	16	!	383	2120	
Dioctyl sebacate	56	e1/e	4.05	4.05	4.03	4.02	4.01	00°†	1	3.77	2.15	
		ten 8	Ð	27	ī	4	7	55	!!!!	1040	1290	
Carbon tetrachloride	52	€,/e°	2.17	2.17	2.17	2,17	2.17	2.17	2.17	2.17	2.17	2.17
÷		tan 8	8	ထ	ተ•0	4.0>	4.0 >	۵ ۷	0 V	۲ ۷	4	16
Tetrachloroethylene	25	c 1/e ₀	2,28	2.28	2.28	2.28	2.28	2.28	1	! ! !	2.28	
		tan 8	15	a	7.0	H	a	α		1 1	10	
Hexachlorobuts. diene 1	25	€¹/€°	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.51	2.47
		tan 8	8	1.5	н	н V	۷ ۲	ณ	16	55	240	130

Chemicals). d. Eastman Kodak. Dried and refractionated, Lab. Ins. Res. e. Eastman Kodak. f. Resinous Products. g. Purified, a. Practical (Solvents Supply Laboratory, M.I.T.). b. Absolute, analytical grade (Mallinckrodt). c. Absolute (U.S. Industrial Lab. Ins. Res. h. Eastman Kodak, fractionated Lab. Ins. Res. 1. Hooker, fractionated Lab. Ins. Res.

II. Liquids B. Organic (cont.)	mt.)	Value	Values for tan	n 8 arre m	8 are multiplied by 10	1 by 10 ⁴ ;	ouenbe u j	or given	n in c/8				
1. Aliphatic (Cont.)	o H		12102	11103	70771	14105	90171	12107	12108	32108	11109	32109	111010
Dichloropentanes #408	25	e,/e°	1	334	17,1	8.65	į	7.76	!	7.57	1 1	6.81	
		tan 8	!		1060000	135000	:	2700	1 1 1	0 1 8	1	1980	
Dichloropentenes #148	25	e'/e _o	1	1	8.24	90.8	8.05	8.05	# ! !				
		tan 8	1	1 1	7500	720	8	16					
Kel-F Oil, Grade #1	S)	¢'/€°	2.61	2.61	2.61	2.60	2.61	2.61	2.58	2.53	1 1	2.34	2.15
i,		tan 6	55	2.3	ů,	1.3	0°8	11	140	380	! ! !	870	860
Kel-F 011, Grade #3	3	e1/e	2.73	2.73	2.73	2.73	2.73	2.73	!	2,48	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	2.22	2,12
,		tan 8	4.9	ထ္	د. د.	1.3	7.3	65	1	930	!	969	750
Kel-F Oil, Grade #10D	52	e'/e	2,83	2.83	2.83	2.83	. 2,83	2.78	1	2.10	:	2.26	2.13
ji			2,1	54.	1.1	6.1	68	393	!	83	-	300	57h
Kel-F Grease #40	52	€'/€°	2.88	2.88	2.88	2.86	2.78	2.57	i ; !	2.25	!	2.20	2.19
		tan 8	5.4	3.8	18	נננ	1430	570	;	350	:	140	106
Perfluorodiheryl ether	25	€¹/€°	1,871	1.871	1.871	!	1.87	1.87	!	1.86	!	1.36	1.85
(experimental)			0.8	0.3	ս. ∨		ņ	3.5	. !	55	!	122	920
Heptacosafluorotributyl	25	e'/e _o	1.853	1.853	1.853	1.853	1.85	1.85	1.85	1.85	1 1 1	1.85	1.85
eaine (exp.)			.15	۸ ن	۲ ۷	۲ >	۷ ۲	1,2	Ħ	23	1 1 1	38	80
2. Aromatic													
HB-40 o11"	25	e:/e	2.59	2.59	2.59	2.59	2.58	2.57	2.54	2,48	1	2,40	2.34
•		tan 8	1.3	† • ∨	# V	۳ ۷	13	16	160	93	1	30	17
Pyranol 1467	25	e¹ /ϵ₀	54°4	야. 4	4.40	04°4	04°.	04.4	4.08	3.19	k t 1	2.8	5,62
4		tan S	36	က	≠ ∨	3.6	25	560	1300	1500	t 1 1	1200	740
Aroclor 1221	S)	e'/e _o	1 1	1 1	1 1 1 1	;	4.55	4.53	4.35	3.85	3.10	2.75	2.65
t		tan ö	:	!!!	!	ì	6	8	800	2000	1900	1030	290
Aroclor 1232	દુ	e'/e,] E 1	:		; ; ;	5.88	5.85	9.4	3.65	3.00	2.82	2.75
2		tan 8	1	1	1	:	55	220	5600	3240	2000	95	51
Aroclor 1242	25	«،/د°	! ! !	! ! !	1	6 6 8	5.89	5.85	3.50	2.93	2.80	2.72	5.69
•		tan 8	1 1	1 1	1 1 1	;	2	200	3000	1850	780	100	223
Aroclor 1248	22	e,/e	.1	1 1	;	5.58	5.57	5.10	2.80	2.76	2.78	2.71	5.68
		tan S	1	:	;	56	560	1900	1000	110	300	151	118
Aroclor 1254	25	رة ₁ /و	:	!	5.05	5.04	3.70	2.90	2.75	2.72	2.71	2.70	5.69
•		tan 8	:	i ; i	겉	415	2380	1130	170	78	52	71	<u>Q</u>
Sharmles h Dollman a	7.00	,		:	;;					•	,	1	701

Elec.). f. Monochlorobiphenyl (Monsanto). g. Dichlorobiphenyl (Monsanto). n. Trichlorobiphenyl (Monsanto). 1. Tetrachlorobiphenyl (Monsanto). s. Sharples. b. Polychlorotrifluoroethylene (Kellogg). c. Minn. Mining. d. Monsanto. e. Chlorinated benzenes and diphenyls (Gen.

_
(cont.
B. Organic
L.fqufds
Ħ.

ci.		o ^E		2017	1*103	40171	- 201×1	1x106	Polxi	1x108	32108	32109	1x1010	
	(cmt.)	2 2	3 / 15	1 7 1	10	5.04	16.4	3.85	2.81		2.74	2.70	2.70	
		Ş	tan S	9.	9	45	84	2500	2100	!	130	ય	38	
	Aroclor 1250b	25	8, /E	4.33	4.26	3.46	2.89	2.83	2.79	!	2.73	!	2.72	
			tan S	8	593	1500	645	185	37	:	4.6	1	4.6	
•	Aroclor 1262 ^c	? L	e'/e	4.03	3.4	2.86	2.76	2.75	2.75	-	1	2.75	2.75	
			tan 8	392	1400	683	186	94	15.7	!	!	6.0	6•4	
	Aroclor 5442 ^d	25	e'/e,	.	!	!	! ! !	!	:	2 8 1	;	2.78	2.78	
			tan S	}		1	!	1	1	1	!	7.2	7.2	
	Halowax oil 1000	3	€1/€	14.77	92.4	4.76	4.75	47.4	1		£9°₦	3.52	2.39	
			tan B	064	ያ	5	۲ ۷	α ∨	;	!	500	2500	1900	
		8	€1/€	1,30	ı.30	4.30	4°56	4.26	!	† 1 1	4.16	3.96	3,30	
			ten 8	7800	930	8	15	11		‡ ! !	170	1,400	2800	
	$\mathbf{I}_{ ext{Itrobenzene}}$	S)	e,/e,	!	į	36	36	35.6	34.4	† ! !	-	31.1		
			tan S	į	1	3900	350	&	8	1	!	0991		
	Styrene M-1008	જ્ઞ	€¹/و	2.10	2.10	2.10	2,10	2.40	2,40	:	!	2.10	2•36	
			ten 8	38	5	< 1	۳ ۷	× ع	۳ ۷	1 1	1	8	58	
	Styrene N-100, purified		e¹/e,	2,40	2,50	0 1 .9	2,40	1	1	:	!	2.38	2,38	
			tan S	15	1.8	< 0.5	< >	1 1	1	!!!	t 5 9	13	37	
	Styrene N-100,8 sat.	27	e,/e,	2.10	2.40	2.40	!	-	!	!	1	2.10		
	with water		tan 8	24	8.4	1.8	:	1	:	!	1 7 1	17		
	Styrene dimer ^E	25	€¹/€°	-	1	!	2.7	2.7	2.7	2.7	1	2.5		
			tan S	:	!	:	6	m	0	18	!	011		
	2,5-Dichlorostyrene	57	e1/e	2.58	2.58	2.58	2,58	2.58	2.58	1	2.58	2.52		
			tan 8	89	6	H	\(\rangle \)	۳ ۷	۳ ۷	:	37	† 11		
	Pyranol 1478 ³	56	e'/e,	4.55	4.53	4.53	4.53	4.53	4.53	1	4.50	3.8		
			tan 8	150	17	α	۸ تر	∾	12	;	381	2310		
	β-chloroethyl-2,5-	24	e,/e	:	6.05	5.45	5.25	5.20	5.20	5.20	5.18	3.31		
	\mathfrak{d} tchlorobenzene		tan 8	1	5000	200	25	20	30	4 30 ·	1100	3240		
	Ethylpolychlorobenzene	25	e'/e	4.12	4.12	4.12	4.12	4.12	4,12	4.10	æ.€	2.70	2.55	
	(discontinued)		tan S	13.6	1.3	٣	۷ ۷	9	55	250	1400	1260	99	
		8	e'/e,	3.62	3.62	3.62	3.62	3.62	3.62	! ! !	3.46	3.12	2.59	
			tan 8	380	Q 1	3.7	1 > 1	H	5	!	220	1720	3800	
												•		

Chemical Co. h. Fractionated (Lab. Ins. Res.). 1. Monsanto (fractionated Lab. Ins. Res.). 3. Isomeric trichlorobenzenes (Gen. a. Isomeric pentachlorodiphenyls (Gen. Elec.). b. Hexachlorobiphenyl (Monsanto). c. Hertachlorobiphenyl (Monsanto). d. Pentachloroterphenyls (Monsanto). e. 60% mono-, 40% di- and trichloronaphthalenes (Bakelite). f. Purified Lab. Ins. Res. 8. Dow Elec.). k. Monsanto. m. DuPont.

II. Liquids, B. Organic (cont.) Values for tan 5 are multiplied by 10"; frequency given in c/s.

3. Petroleum Ofls	T _O		12102	1x10 ³	1410	20171	1x106	12107	32108	3x108	3109	121010
Aviation gasoline	25	6 1/6°	1	1 1	1.94	!	:	i	į	1.94	1.8	
100 octane		tan 8	!	! ! !	rH	!	!	!	!	80	† 1	
Aviation gasoline	25	€¹/€°	1 1 1	:	1.95	!	!	!	1 1 1	1.95	1.94	
91 octane		tan 8	;	1 1 1	#	1	1 1 1	1 1 1	!	ᡮ.	11.5	
Jet fuel JP-1	25	61/e°	i	!	2.12	1 1 1	1	1 1 1	!	2.12	2.09	
		ten 8	:	! ! !	г У	:	!!!	1 1 1	1 1	ដ	98	
Jet fuel JP-3	25	e¹/e°	1	1	2.08	1	! ! !	1	: : :	2.08	2.04	
		tan 8	! ! !	5 8 8	V		!	!	1 1	2	55	
Kerosene	25	€¹/ ⁶ 0	!!!	. E E E	-	!		! ! !	1 1	1	5.09	
		tan S	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	!!!	i		!!!	!	1	!	45	
Vaseline	25	e1/e	2,16	2,16	2.16	2,16	2.16	2.16	2.16	1	2.16	2,16
		tan 8	3	์	∾ ∨	< 1	۲ >	۳ ۷	. . † ∨	1 1 1	9.9	10
	8	e'/e _o	2,10	2,10	2.10	2.10	2.10	t t	1	1 1	2.10	2,10
,		tan 6	16	3.6	6.	< 1	۲ ۲	1	1 1 1	1	8.6	었
Cable 011 5314	25	e'/e _o	2.25	2.25	2.25	2.25	t ! !	1 1	1 1	42°3	2.22	2.22
		tan 8	3	₩°0 >	₺*0>	1 ×	1	1	! ! !	39	18	82
	8	e'/e _o	2.18	2.18	2,18	!	1	1 1 1	. !	1 .	2.18	
		ten 8	38	4	0.5	: :	1 1 1 1	1	! ! !	:	L4	
Cable oil FLio1270	56	e'/e ₀	2.20	2.20	2.19	2,18	2.18	2.17	2.17	2.17	2,16	2,16
		tan 8	1.3	6.0	9.0	m	1.7	217	51	t 1 3	20	18
Transil 011 100	58	e'/e	2.32	2.25	2.22	2.25	2.52	2.55	2.20	2,19	2.18	2,10
¢		tan 3	4	۲ ۲	٧ ٢	9 >	< 5	80	84	55	28	20
Bayol-D	45	e'/e _o	5.06	5.06	2,06	2,06	90°ē	5.06	1	:	2,06	5.06
		ten 8	н	< 1	۲ ۷	α V	۳ ۷	۷ ک	1 1 1	1 1	13.3	25
Bayol-F	1 78	€¹/Eo	2.14	2.14	2.14	!	; ; ;	!!!!	!	!	2.13	2.13
•		ten 8	6.7	1.6	۲ ۷	!	1 1 1	!	!	1 1 1	10.5	†t
Marcol	42	د ا / د ٥	2.14	2.14	2.14	2.14	2.14	2.14	1 1	1	2.14	2.14
		tan 6	7	۲ ۲	۷ ۲	а V	<i></i> ∨	۳ ۷	1	1 1	1.6	น

3. Aliphatic and arcmatic hydrocarbons (Gen. Elec.). b. California Res. Corp. c. 77.6% paraffins, 22.4% naphtheness (Stanco). d. 74.5% paraffins, 25.5% naphthenes (Stanco). e. 72.4% paraffins, 27.6% naphthenes (Stanco).

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2.5x1010					c,	6			엄	ጼ				13	8		01	19	8	55	S.								
	_				•					8																			
11010	2.14	18	2,15	13.5	2,16	11.3	2,16	10.6	2,16	18.6				2.19	30	2.63	270	2.72	210	2.70	320	2.74	330			5.69	225		
3x109	2.14	9•3	2.15	6.6	2.17	7.2	2.17	7.7	2,16	13.4		2.20	18.6	2.20	14.5	2.65	68	2.75	お	2.76	96	2.74	96	2.87	130	2.72	103	2.55	8
3x108	!	!	1 1	1 2 2	1	!	į	!	2,16	16.3		:	!	2.20	₽. L		1	1	1 1	* :	1 1	!	!	1	!	2.74	ជ	1	1
1x108	1	i	i	!	!	-	!	!	2,16	70		1	!	1 1	‡ ‡ ‡	!		1 1	1 1	!	!	1 1	!!	1	1	!	1 1	1	:
12107	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!		2.15	რ V	2.17	۳ ۷	2.17	۳ ۷	2,16	က		2.20	લ V	2.20	α V	5.66	m	!	!	:	1 1 1 3	2.78	۷ ۷	8.8	α	2.75	QI	2.56	a
901मा	!	1	2.15	α ∨	!	!	2.17	α ∨	2.16	ا		2.20	۸ 3	2.20	۶ ۸	5.66	۳ ۷	ļ	1		1	2.78	ς V	2.90	۸	2.75	د م	2.56	ω V
दुशम	1	!	2.15	α V	2.17	0≀ ∨	2,17	ପ V	2,16	۸ ت		2.20	√	2.20	٠ ٧	5.66	V	:	- :	į	į	2.78	რ V	2.90	^ 2	2.75	۸ تر	2.56	۸ بر
7017	2.14	1 V	2,15	۲ ۷	2.17	년 V	2.17	۲ ۷	2,16	† •0 >		2°50	ر ۷	2.20	†•0>	5.66	₹*0>	2.76	₹ 0 >	2.76	4.0 >	2.78	9.0	2.90	۳ ۷	2.75	₹ 0 >	2.56	< × 3
11103	2,14	a	2,15	н	2.17	ر د	2.17	۲ ۷	2.16	<0.8		2,30	ლ V	2.20	† •0>	5.66	1.5	2.76	†°0∨	2.76	ቱ•0	2.78	0.8	2.90	< 3	2.75	0.2	2.56	۳ ۷
1x10 ²	2.14	12.6	2.15	7.7	2.17	۸ ۲	2.17	ر د	2.16	<0.8		2.20	۸ ر	2,20	н	5.66	12	2.76	4,*0	2.76	0.8	2.78	0.8	2.9	۸ ر	2.75	0.5	2,56	Λ • π
	61/ 6		e1/e		£1/€		e'/e		€¹/€°			e'/e _o		E1/E		e1/e		«،/د »		e1/e,		e1/e		G1/E		e'/e,		e1/e	
ည မ	₹८		24		56		4₹		25			-15		8		23		25		23		25		-17		23		83	
3 Petroleum Oils (cont.)	Bayol		Bayo1-16		Fractol A ^c		Primol-Dd		Diala 011 15	-	4. Silicones	DC500	0.65 cs. at 25°C ^f			DC500	10 cg. at 25°cf	DC500	100 cs. at 25°Cf	DC200	100 cs. at 25°cf	DC200	1000 cs. at 25°cf	DC200	$7600 \text{ cs. at } 130^{\circ}\text{cf}$				

a. 72.0% paraffins, 28.0% naphthenes (Stanco). b. 68.9% paraf ins, 31.1% naphtheness (Stanco). c. 57.4% paraffins, 42.6% naphthenes (Stance). d. 49.4% paraffins, 50.6% naphthenes (Stance). e. Petroleum hydrocarbons, mainly naphthenes (Shell). f. Methyl or ethyl silozane polymer (Dow Corning).

Transda B Organic (cont.)		ues for t	Values for tan 5 are	multipli	ed by 10	t frogu	ency giv	on in c/	·B.			
TI. Pridatas and and	£		12102	11103	1±10 ⁴	2 1x10 ³ 1x10 ⁴ 1x10 ⁵ 1x10 ⁶ 1x10 ⁷ 1x10	1106	Polar	12108	32128	32109	12101
h. Silicones (conc.)	الا	a1/a	6	8	8	8.8	2.30	2.88	1	2.88	2.77	2.8
DC550-	ĵ	tan S	1630	170	18	3.7	3.8	12	1 1 1	130	210	220
BOLLON	32	61/6	2.98	2.98	2,98	2.98	2.98	2.97	1	2.93	2.79	8.6
07 27	`	ten 8	. 27	1.6	۲.	٣	01	57	!	500	1,40	170
TOOL TO TO THE PARTY OF THE PAR	25	£1/€	2.75	2.75	2.75	2.75	2.75	2.75	2.7h	2.72	2.65	2,49
dilling the	ì	tan S	. 17	9	2	ᆄ	4	9	15	58	8	270
Pomia II .	8	9/13	2.6	2.6	5.6	5.6	2.6	1 1 1	:	! ! !	2.5	
	ı	ten 8	4	378	9	#	. † ∨	1	!	1	24	
201-90ES	25	8/,3	2.7	2.71	2.71	2.71	2.71	2.71	1	2.71	2.70	2.67
		ten 8		<.03	<.03	٠ .	۲ ۲		!	11	95	186
SF96-100°	25	E1/E		2.73	2.73	2.73	2.73		!!!	2.73	2.71	2,69
	•	tan o		90,>	<.03	гН .V	٦ >		! !	77	101	, 8
SF96~1000°	25	£1/E		2.73	2.73	2.73	2.73	2.73		2.73	2.71	2.695
		tan 3		<.03	<.03	× .3	V Ц		;	13	106	203

a. Methyl and methyl phenyl polysilozens (Dow Corning). b. Organosilozens polymer (Dow Corning). c. Gen. Elec.

Supplementary High-Temperature Data on Plastics

					Fre	Frequency given in	ven in	c/B.		
	of the		102	103	701	4x104	FQ2	106	3x108	3x109
Formica FF-41 (after 5 yrs. storage,	ις,	e'/e _o	6.27	6.19	6,12	80.9	5.97	1	3.87	4.2
Various samples)		tan 8	.018	.0085	.0081	0600.	.012	1	.0143	.021
	100	e'/e _o	1	11,2	6.73	6.23	6.07	!	00° †	4.3
		tan 8	1	.50	.18	.055	0 ⁴⁰	ŧ ; !	4410.	.020
Formica LE (after 5 yrs. storage)	25	e'/e _o	5.92	5.32	5.01	14.87	4.86	4.85	!!!	3.63
		tan 8	.112	.057	.038	•036	ono.	540.	1 1	.037
	30	e1/e	:	16.0	8.16	69.9	6.22	5.84	!	4.10
		tan 8	:	54.	.29	.173	.151	.080	1 1	290.
Formica MF-66	200	e1/e°	1 1 1	12,8	7.17	4.9	!	!	; ! !	46.4
	٠	tan 8	! !	748.	.245	.134	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	1	2 1 1	.059
Formica XX	100	د'/د °	9.77	99.9	5.87	5.6¢	5.61	5.4	i 1 1	4.09
		tan 8	ય	.195	.073	940.	.035	.029	t 1 1	.102
Micarta 259	100	61/6	9.39	6.75	6.14	6.03	1 1 1	:	5.5	
		tan 8	44.	.16	.043	.022	? !	1 1	.025	
Micarta 299	200	e'/e _o	12,8	6.7	5.0	4.8	4.75	9.4	4. 4	
		tan 8	.59	,36	.158	.081	940.	.015	910.	
Micarta 496 (after 5 yrs. storage)	25	د ا/د	7.31	6.35	5.89	5.73				
		tan 8	91.	ή λο •	.045	.041				
	100	e'/e _o	1	15.5	8.53	7.42	7.26	6.31		
		tan 8	;	• 68	.305	.178	911.	1 90°		

Supplementary High-Humidity Data

	10,10	7.12	.0033	7.18	010		٠																						
	3×108	1 ! !	:	!	! ! !							;								;						5.55	.027	6.5	±50°
	42107	7.36	.0012	7.36	6100.							:	-							1					·	- 1	1 1	:	! !
c/B.	107	7.38	.0013	7.38	.0021							!								1 1						1	1 1	!	i ; i
given in c	106	7.39	.0013	7.39	.0029	4.36	.028			45.4	.056	19.4	.0055			٠		4.18	£40°	ħ9°ħ	.0052			8.0	-25	1	1 1 1 1	t !	;
luency gi	[6]	7.40	4100.	:	;	4.50	.021			5.4	.078	4,72	0900.					! ! !	1 1 1	19.4	.0065			11.7	14.	;	t t t	1 1	;
Frec	103 104 105	7.42	9100*	7.42	•0068	4.62	020	₹. †	11.	6.3	.12	4.74	.0075	3.70	.012	5.15	.057	5.51	.111	p. 70	•0080	6.4	910.	5년	.75		;	}	1 1 1 1
	[6]	7.45	.0019	7.45	2600.	47.4	.022	5.4	.19	7.8	-20	08.4	-0082	3.78	.015	5.78	60.	6.75	.169	4.72	.0077	5.0	.018	61.4	1.04	;	; ; ;	;	:
	102																												
		e,/e°	tan 8	€,/€	tan ô	و,/و	tan 8	e,/e	tan S	e'/e°	tan 8	e1/e	tan 8	e;/e°	tan 8	e¹/e°	tan 8	e¹/e°	tan 8	e¹/e°	tan 6	e'/e ₃	tan 8	ε¹/ε _ο	tan 8	e¹/e°	tan 8	e'/e,	tan 8
	o H	25		25		25		25		25		25		25		25		25		25		25		25		25		25	
		Mycaler 400, dry		after 48 hrs. in H20		Bakalite BM 120, dry		after 19 days, 90% rel. hum.		after 18 mos., 90% rel. hum.		Bakelite BM 262, dry		after 20 days, 90% rel. hum.		after 7 mos., 90% rel. hum.		after 19 mos., 90% rel. hum.		Bakelite BM 1895, dry		after 20 days, 90% rel. hum.		after 19 mos., 90% rel. hum.		Formica FF-55, dry		after 20 hrs. in Ho	

Supplementary High-Humidity Data (cont.)

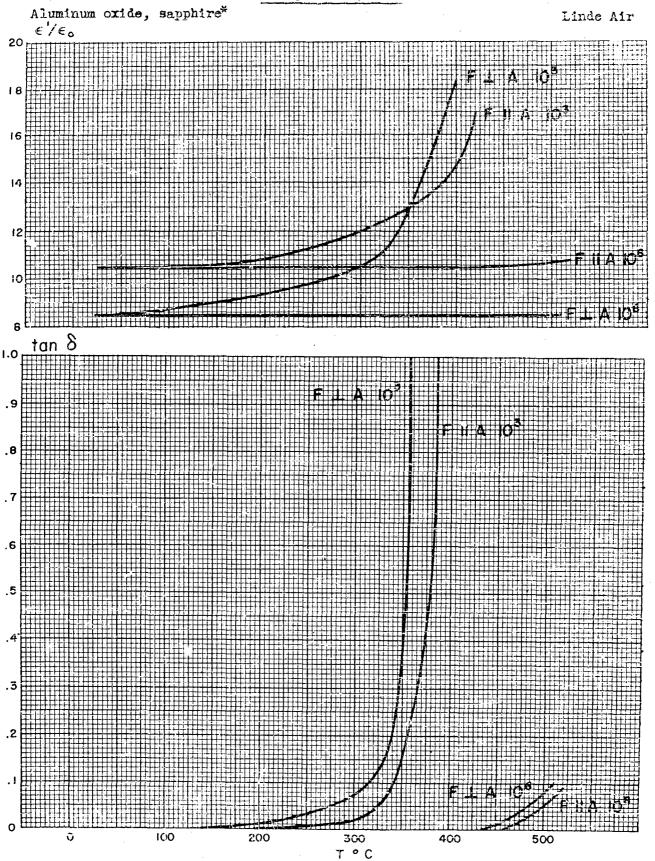
				Ħ	equency e	Frequency given in c/s.	/B.		
10°C 10°E	OH.		102	103	†o	102	106	3x109	
GMG Melemine, dry	25	e,/e,	8,2	7.0	6.7	9.9	4.9		
		tan 3	.19	690*	.019	010	.011		
after 6 or 8 mos., 90% rel.hum.	25	e'/e,	42.5	16.8	10.4	7.65	6.57		
		tan 8	.75	₽.	.27	or.	• 030	4.	
Hysol 6030, dry and after 4 days	in H ₂ 0,	no change	at lx139					(

Hysol 6030, dry and after 4 days in Ho,0, no change at lxio	in Hoo,	no change	at lx13					
Lucite HM-119, dry and after 18 months at 90% relative humidity, 25°C, no change in the range 10° to 10° c/s.	omths a	t 90% rela	tive humi	dity, 25°	c, no ch	nt egu	the range	10 ² to 10 ⁶ c/s.
Lumarith 22361, dry	25	e'/e,	!	1	† ! !	!!!	1	2°47
		tan 8	1	1	!	!	!	9610.
after 20 days or more	25	e'/e,	1	; ;	1 1		;	3.14
at 90% rel. hum.		tan 8	1	1	-	!	1	240°
Micarta 496, dry	33	£1/€	!	\$ 	1 1	1	!!!	3.78
		tan 8	1 1	;	!	-	1	•059
after 24 hrs., 90% rel. hum.	25	e'/e	1	!	1 1	;	.1	3.94
		tan 8	;	\$!	:	1	1	.071
Nylon, See page 23								
Poly-2,5-dichlorostyrene, dry	52	e'/e	: :	;	1 1	!		2.59
		tan 8	1	!	1 1	;	1	92000
after 20 days. 90% rel. hum.	25	E1/6	:	1	1	!	1	2.59
	•	tan 8	!	8 8 8	1	1	1 1	.00055
Polystyrene, See pages 36 and 37								`
Polythene, dry	25	e'/e_	!	 	1	!	1	2.26
		tan S	1	1	1	1	2 <u>1</u> 3	19000
min for 200 same 10 tratte	ί	a, /a	1	¦	1 1		1 1	2.26
great to make down the tere)	,0,						2000

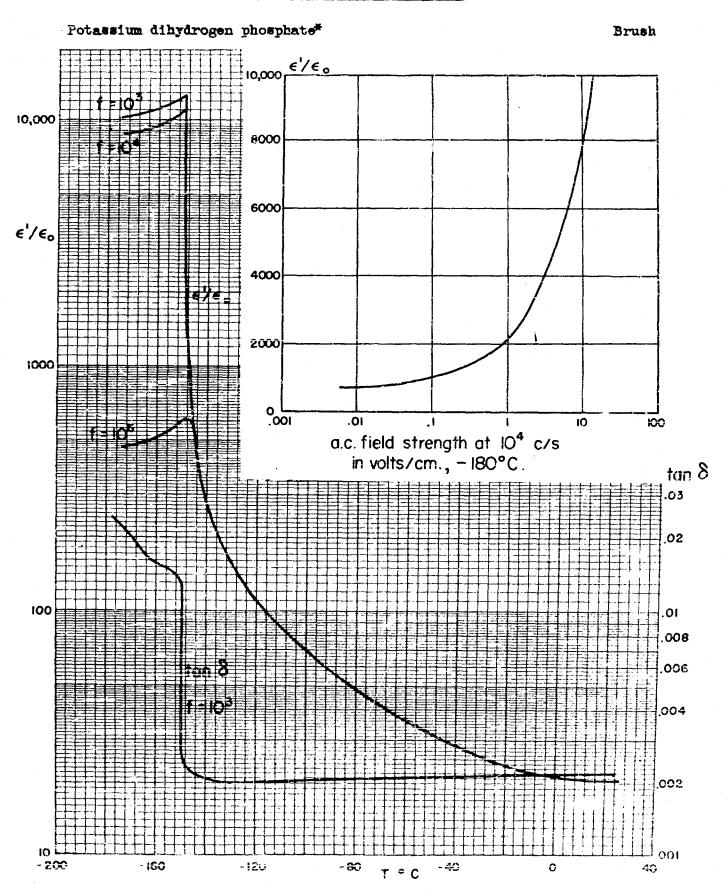
Vinylite VU-1900, dry and after 18 months at 90% relative humidity, 25° C, no change in the range 10^{2} to 10^{6} c/s. Teflon, dry and after 18 months at 90% relative hundrity, 25°C, no change in the range 10^2 to 10^6 c/s.

Data at Fixed Frequency as a Function of Temperature

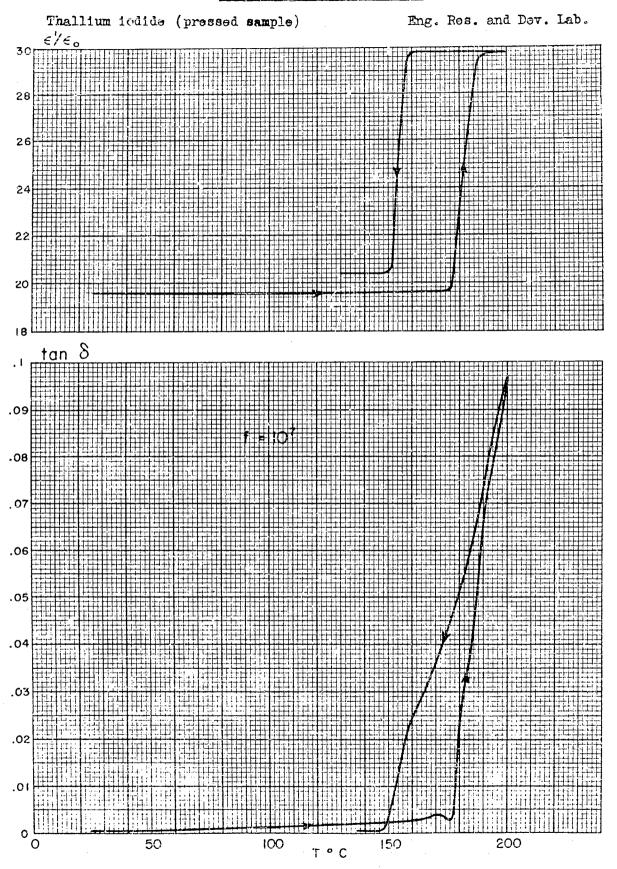
Inorganic Crystals

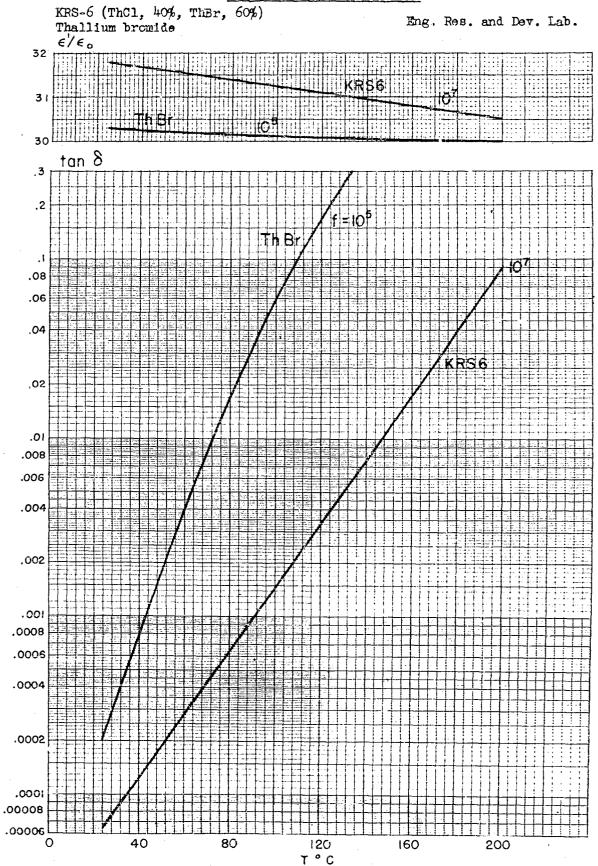


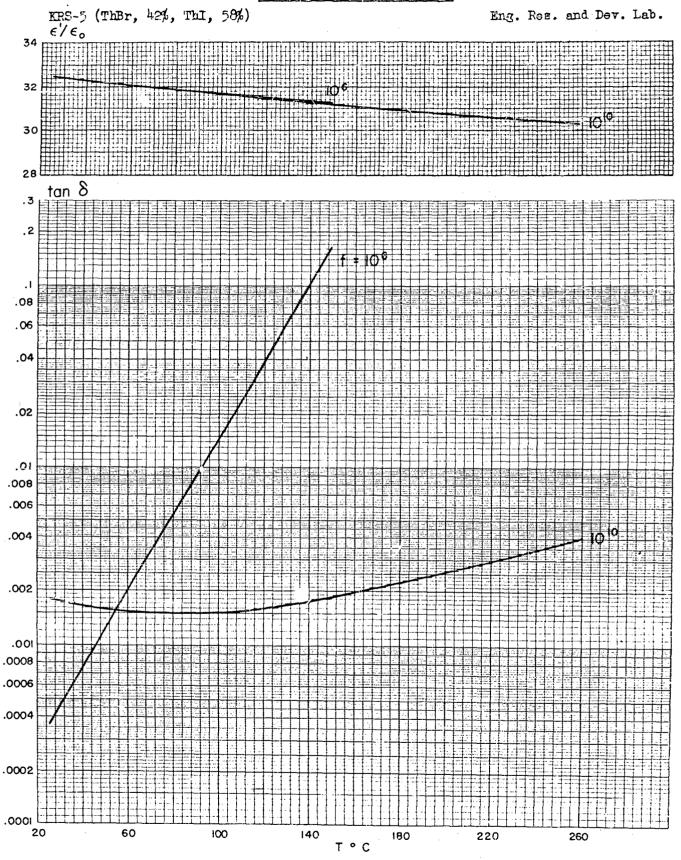
*Field L to optic axis and field II to optic axis.

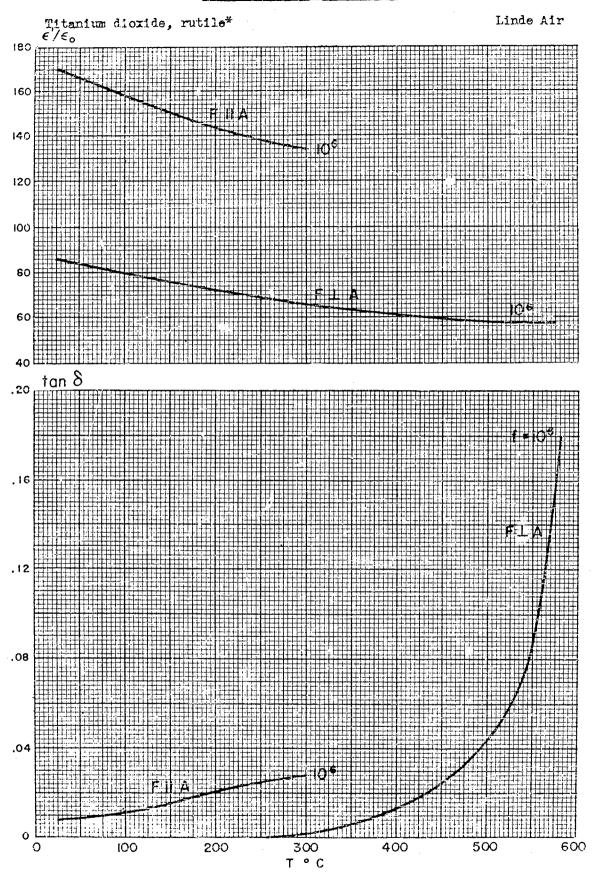


*Field II to optic aris, 15 volts/cm.









*Field _ to optic axis and field H to optic axis.

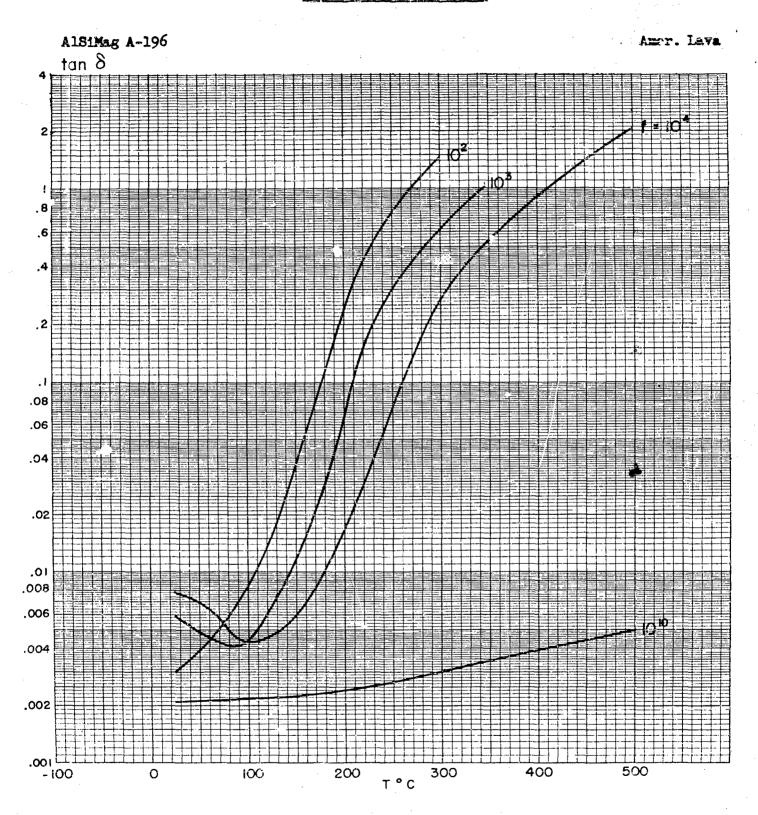
Steatite Bodies

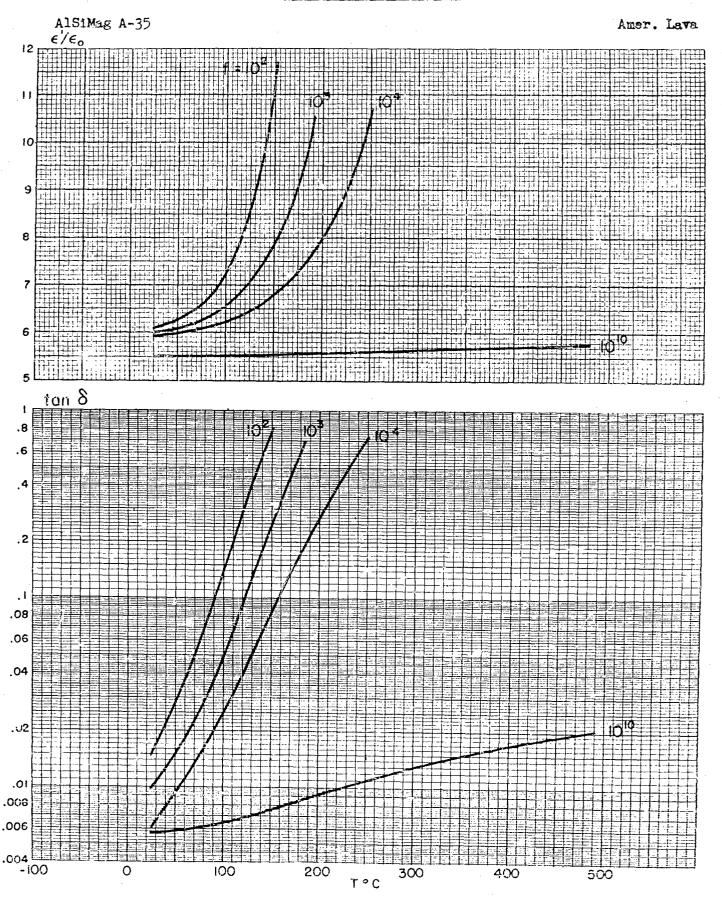
AlSiMag A-196 Amer. Lava ϵ'/ϵ_{o}

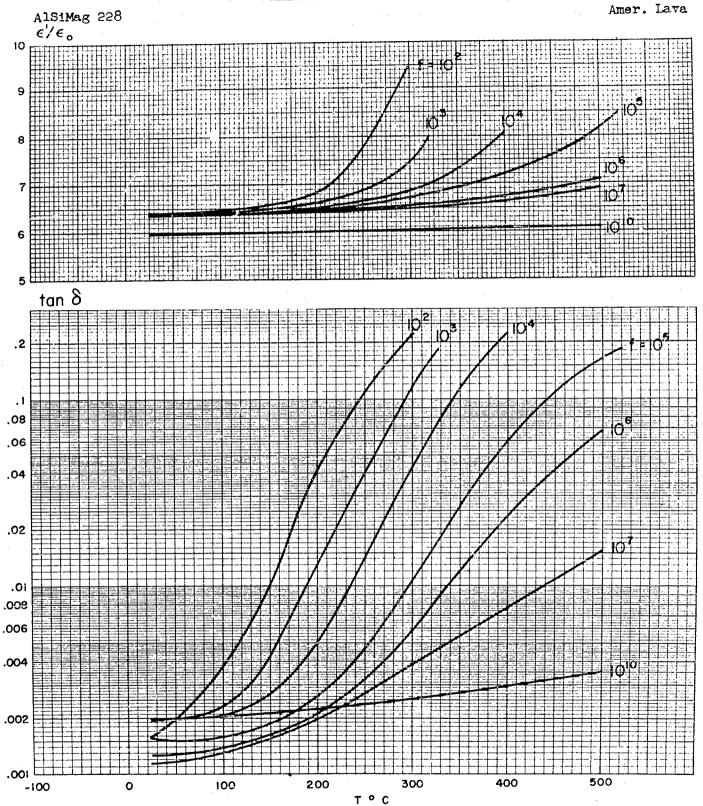
500

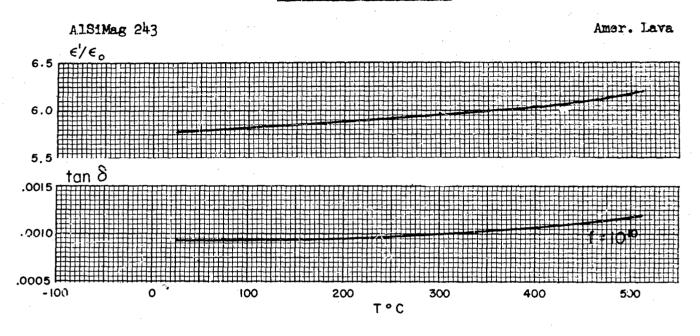
-100

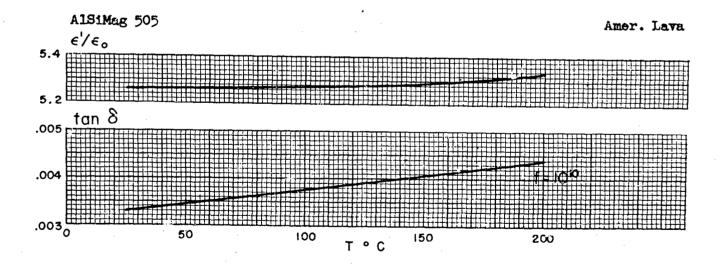
100

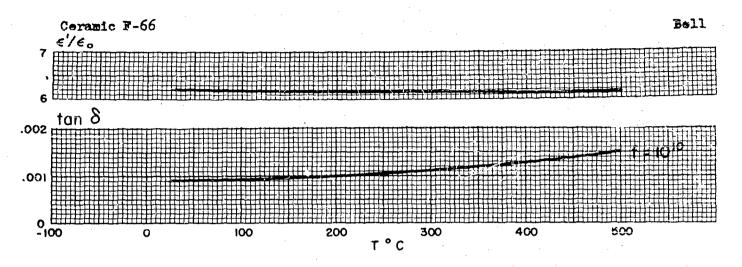


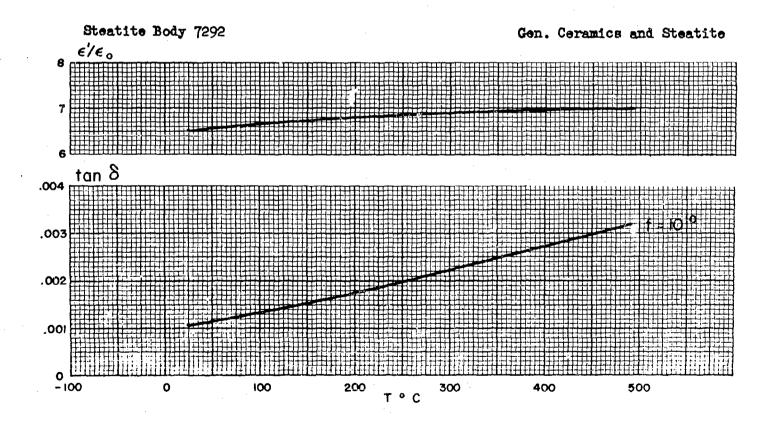


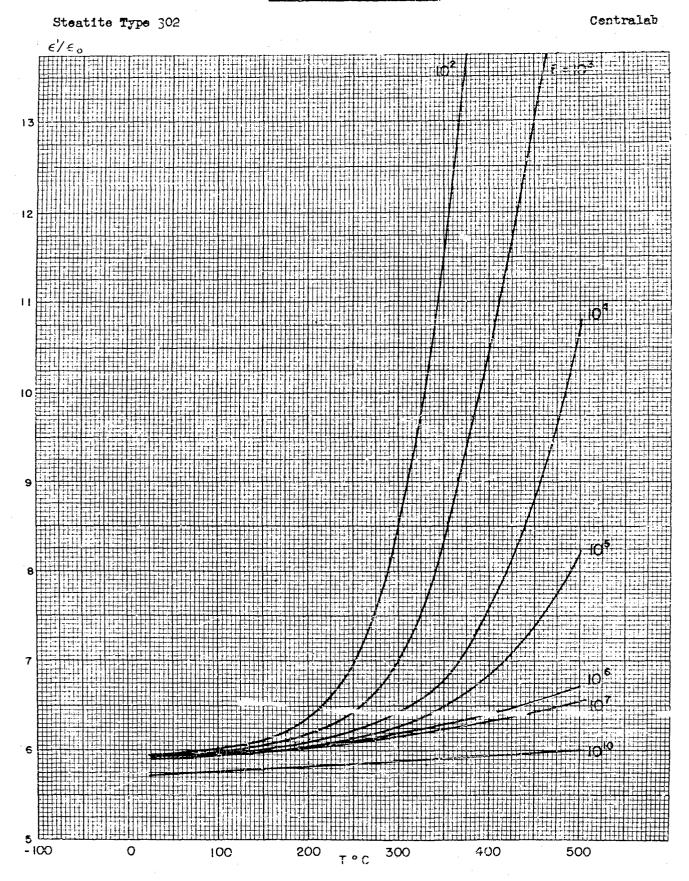


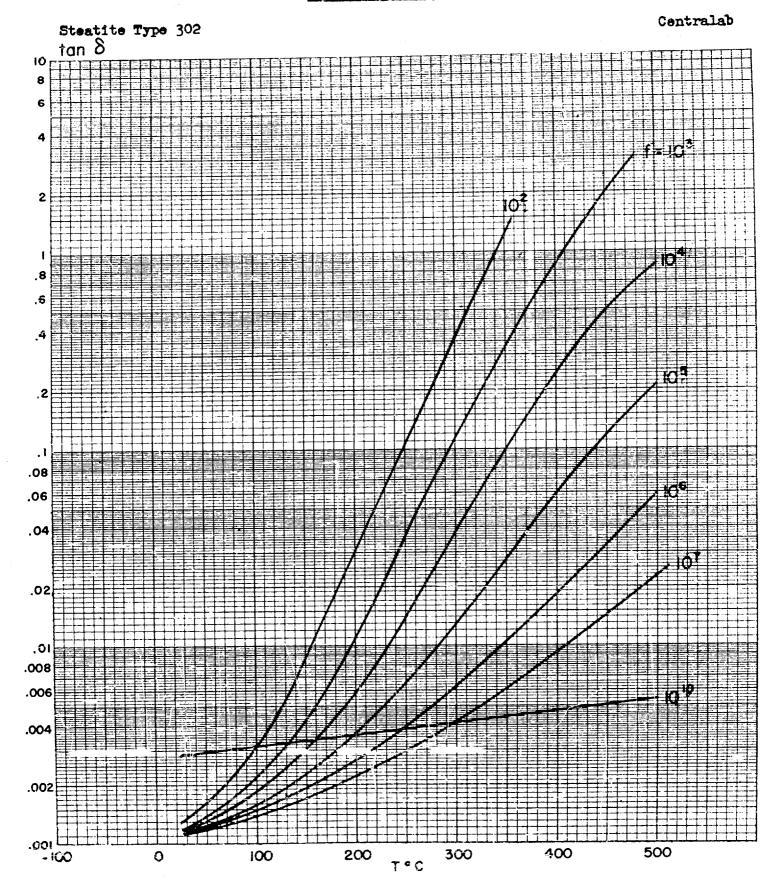


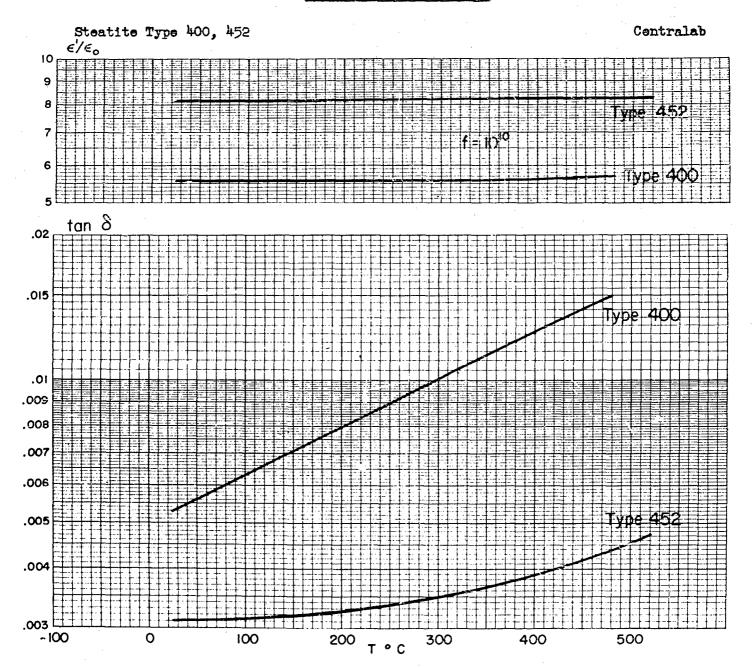


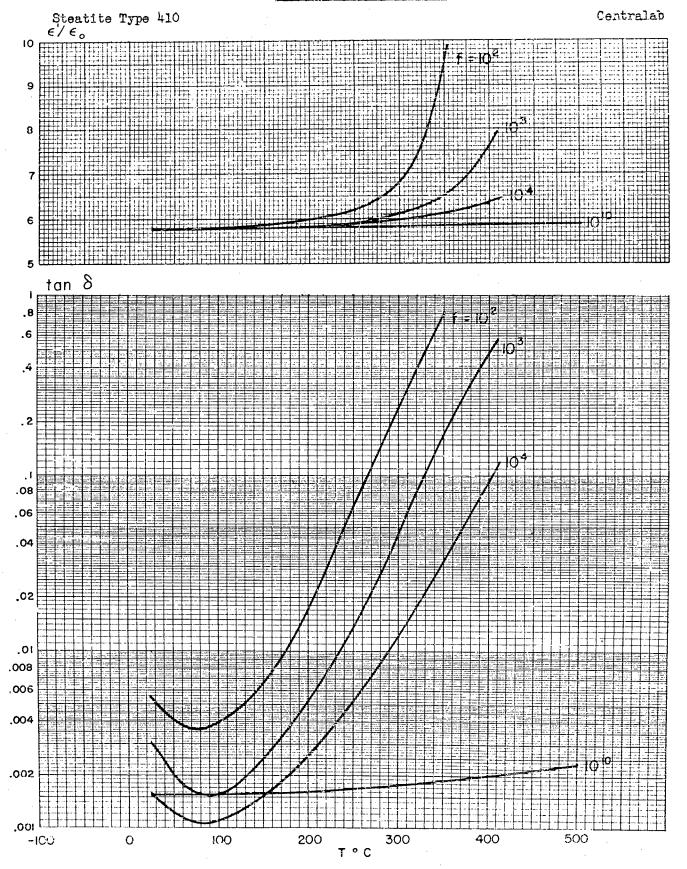




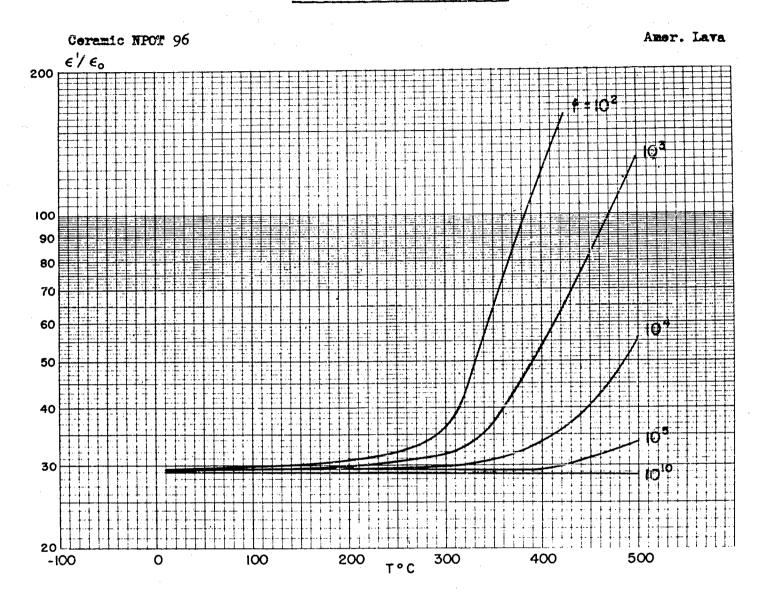




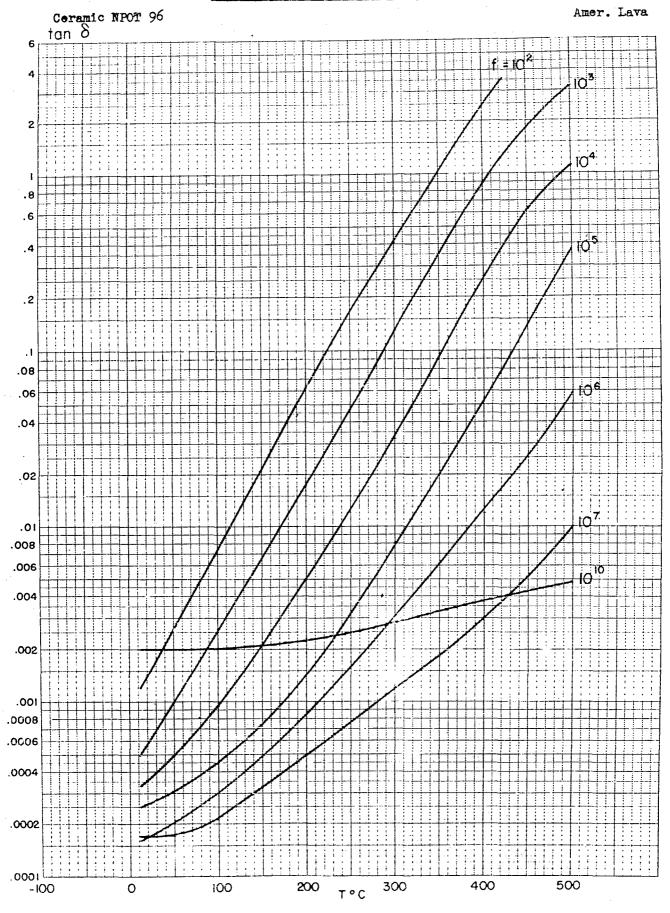




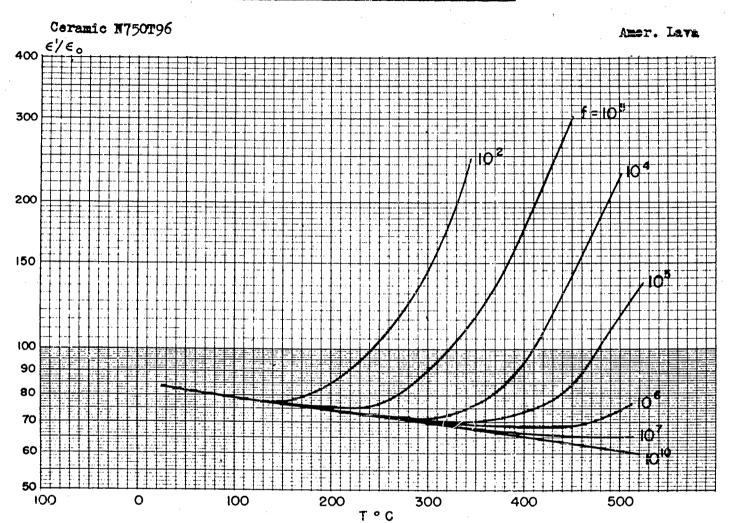
Titania and Titanate Bodies



Titania and Titanate Bodies (cont.)

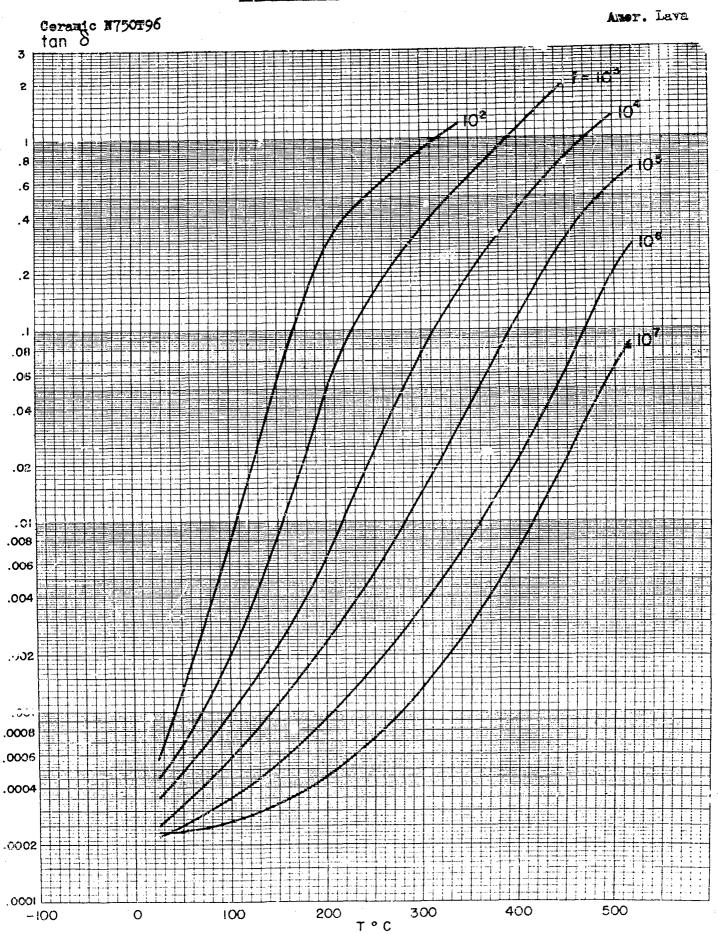


Titania and Titanate Bodies (cont.)

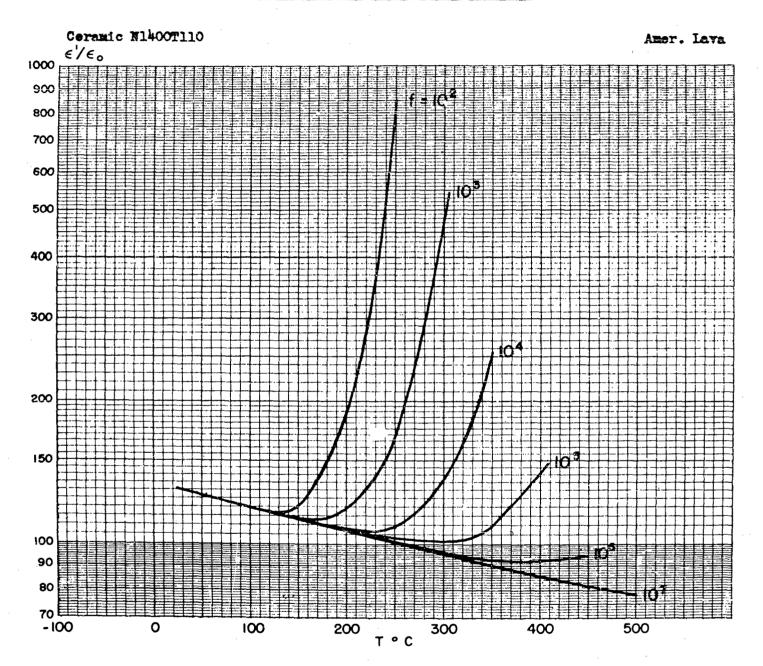


1 11

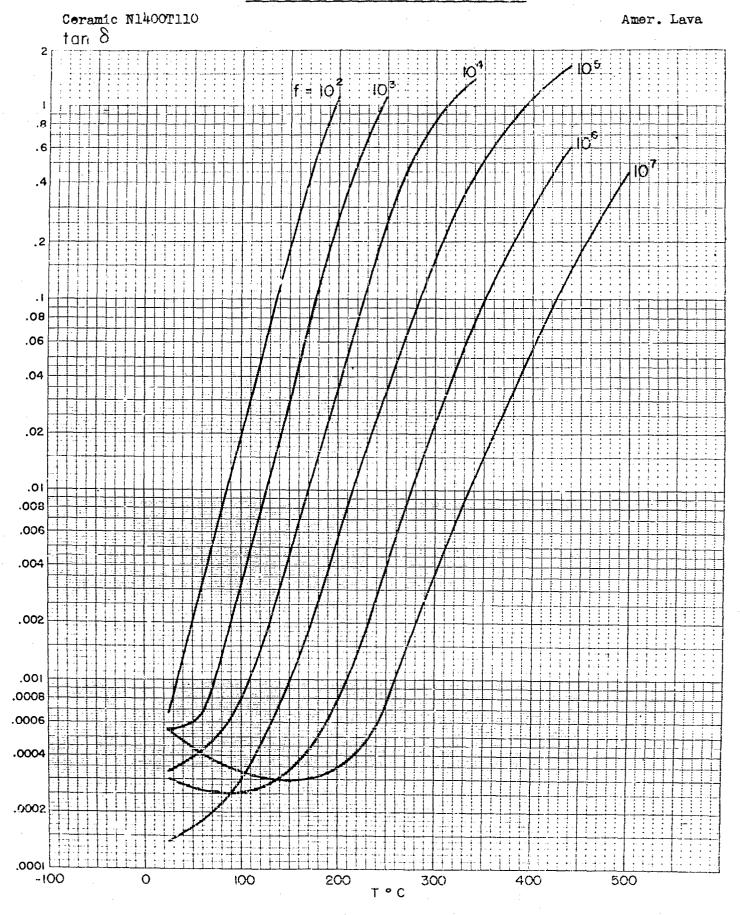
Titania and Titanate Podies (comt.)



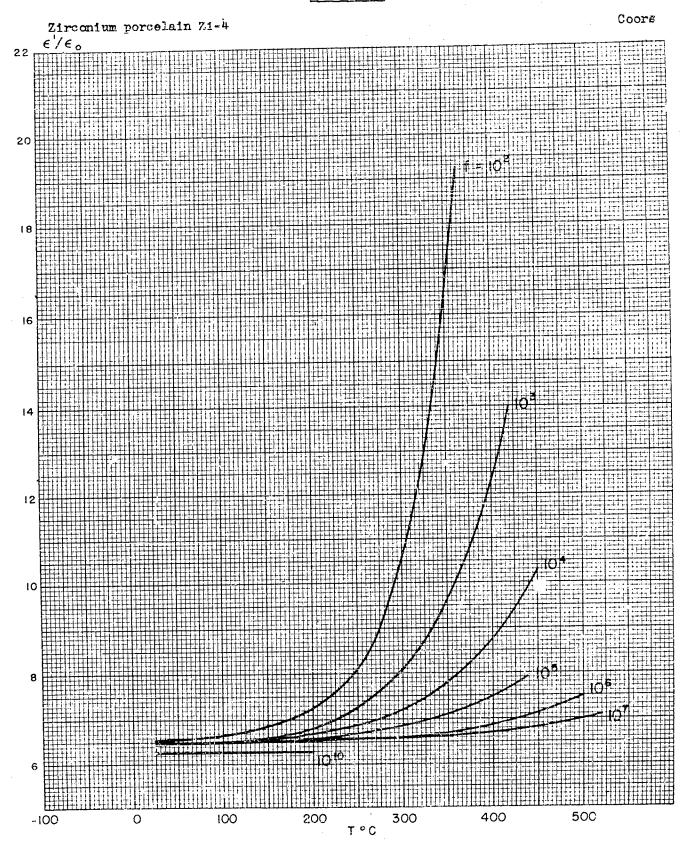
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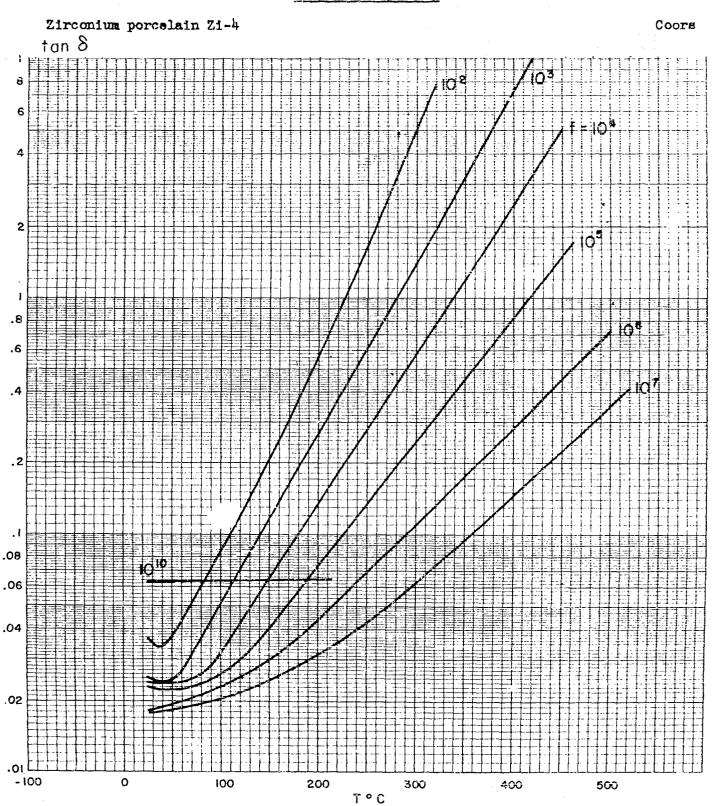


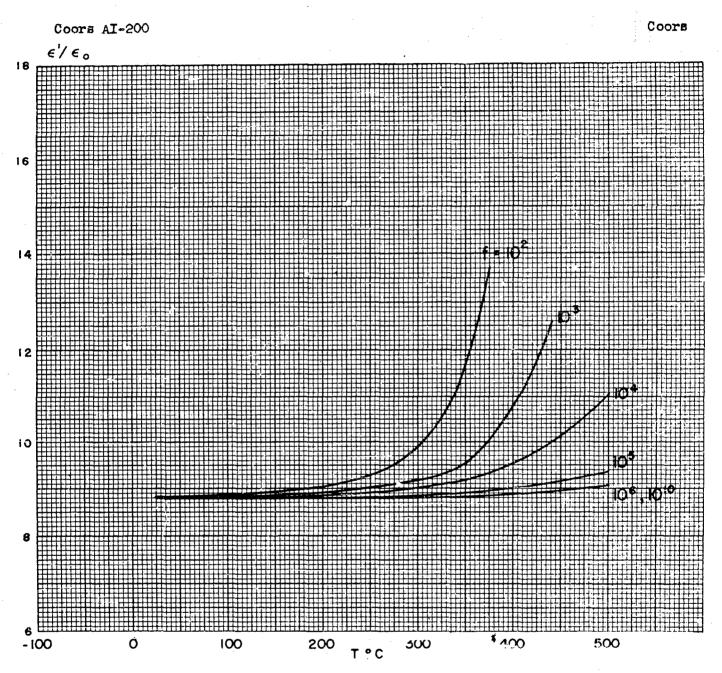
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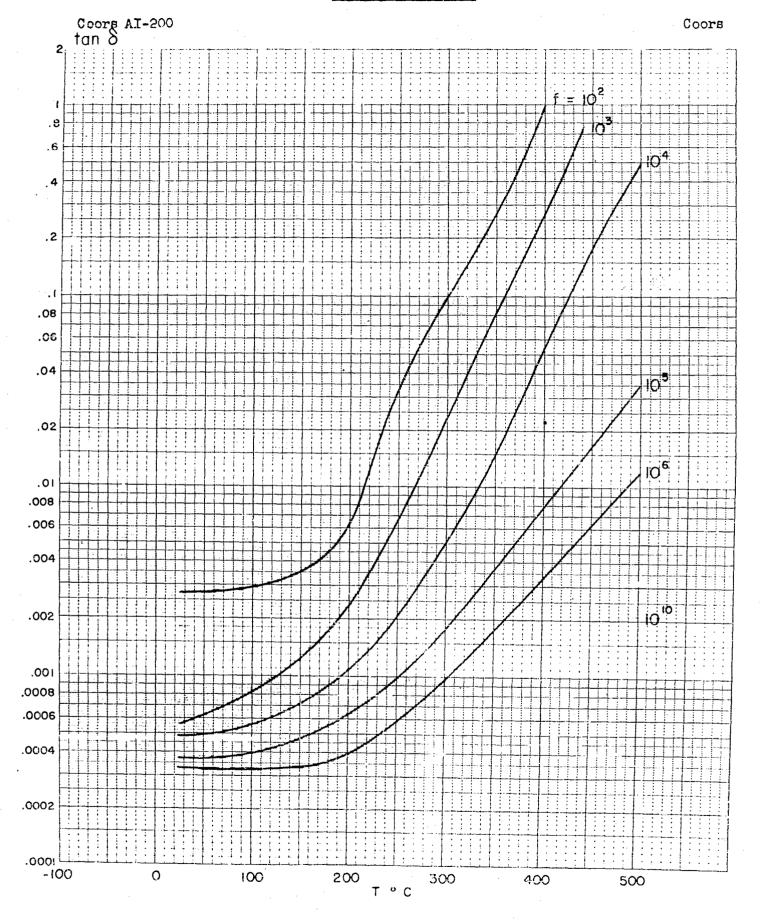


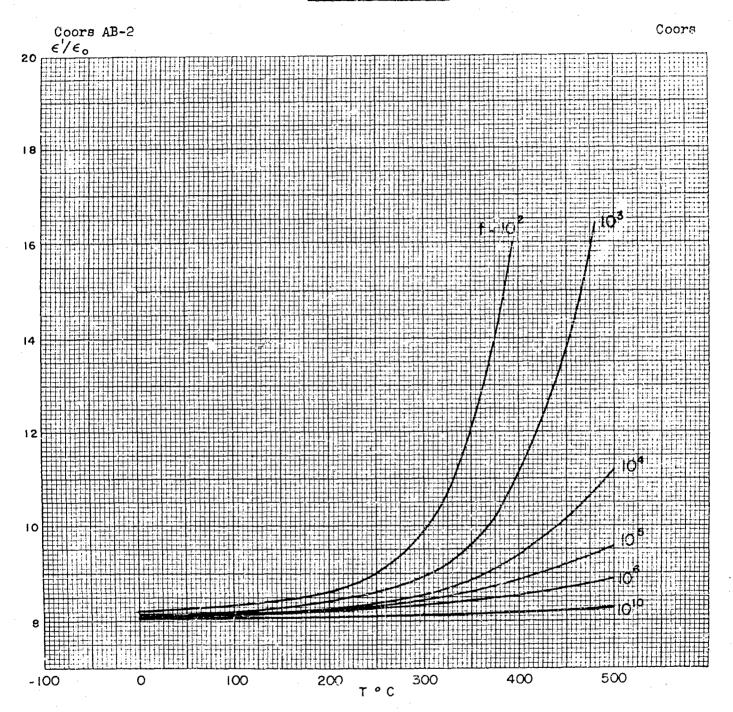
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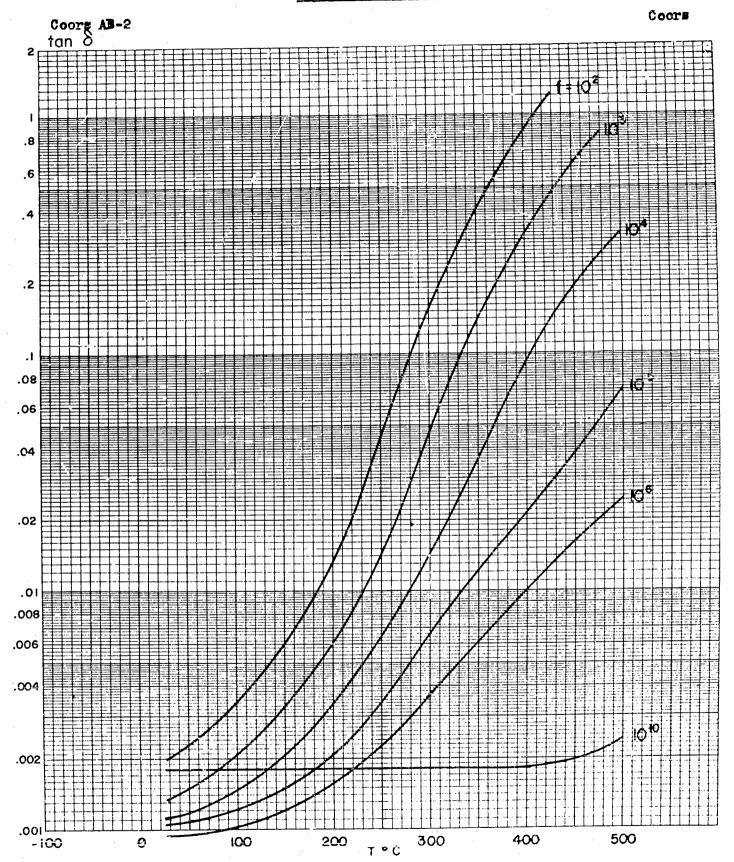


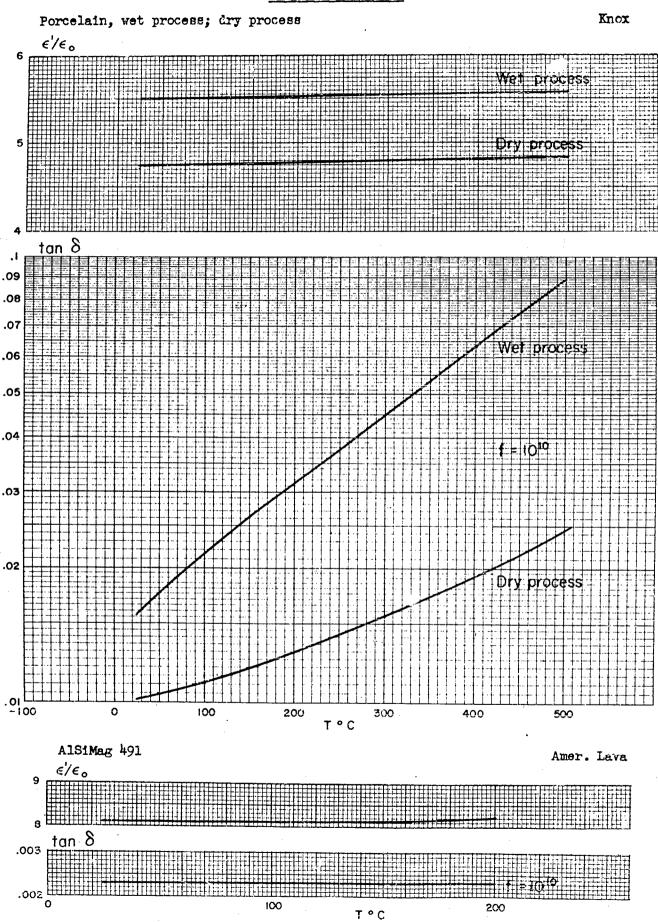




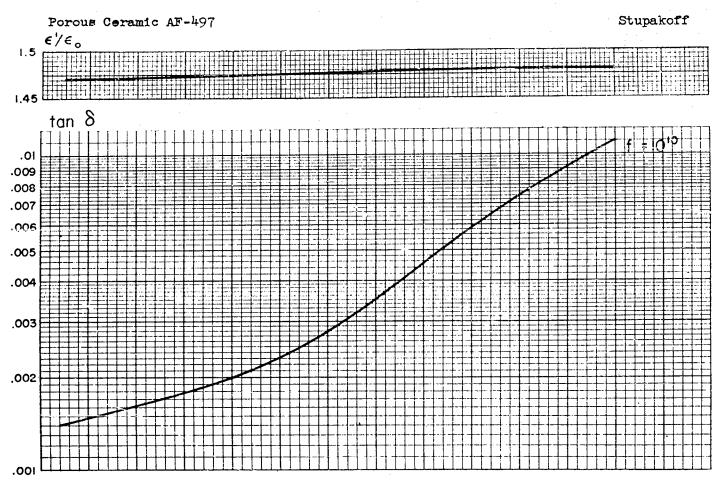




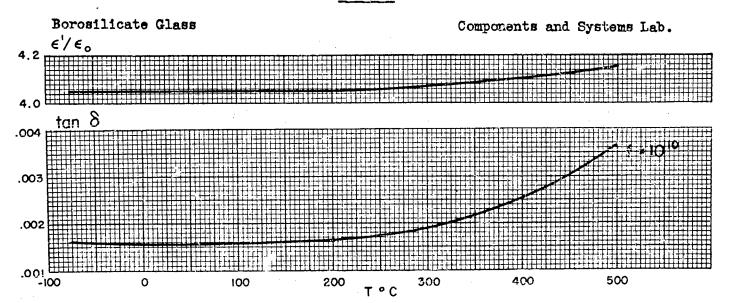


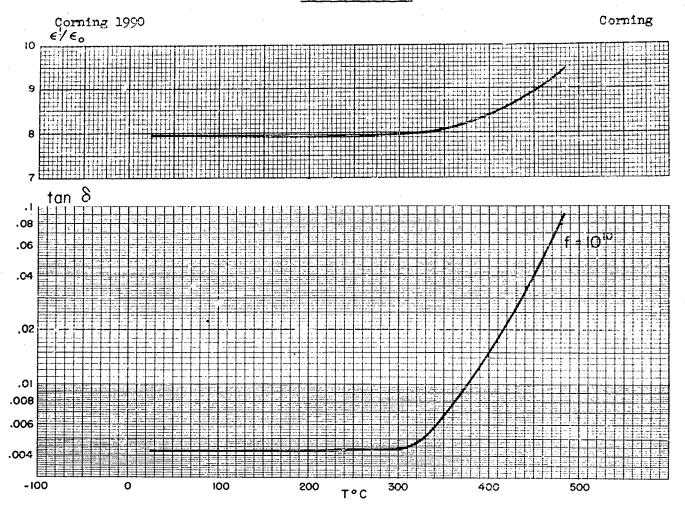


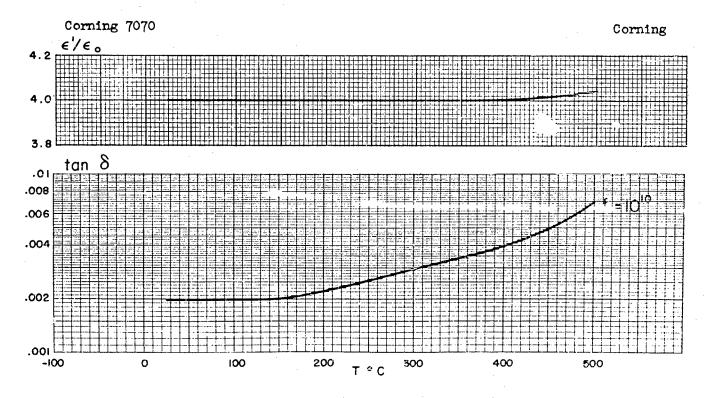
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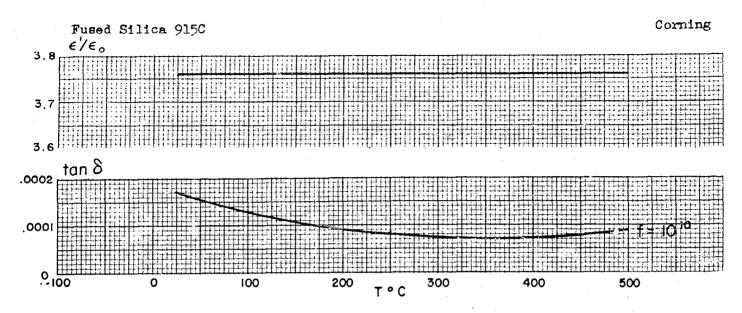


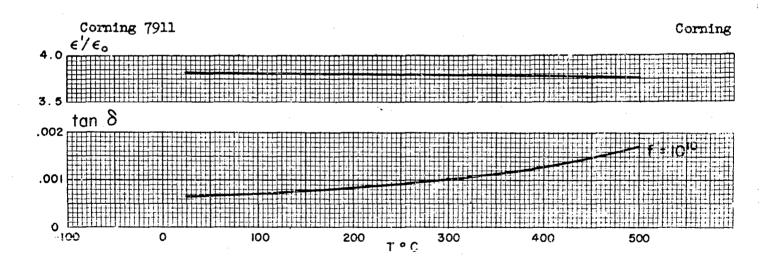
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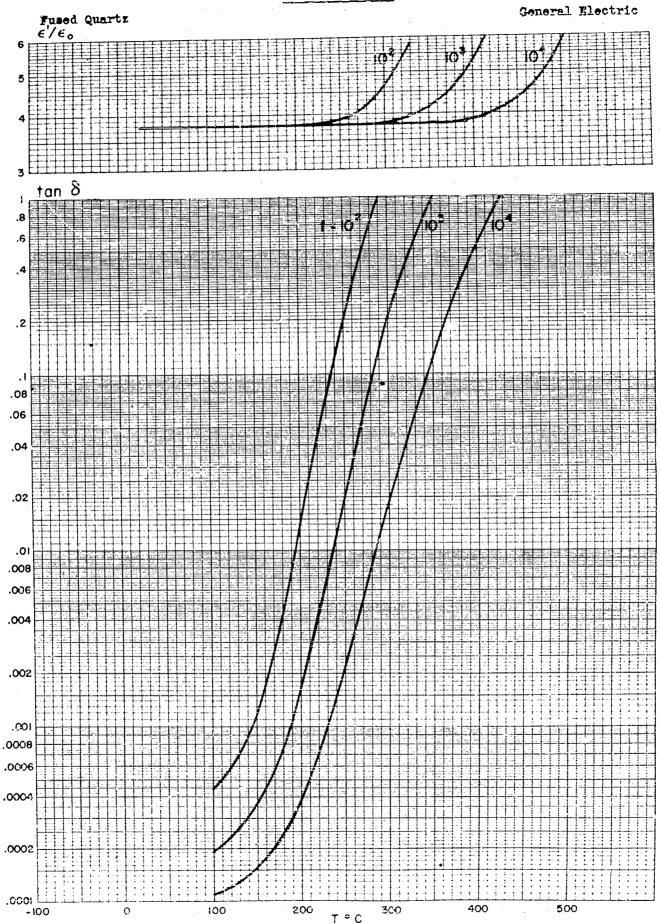


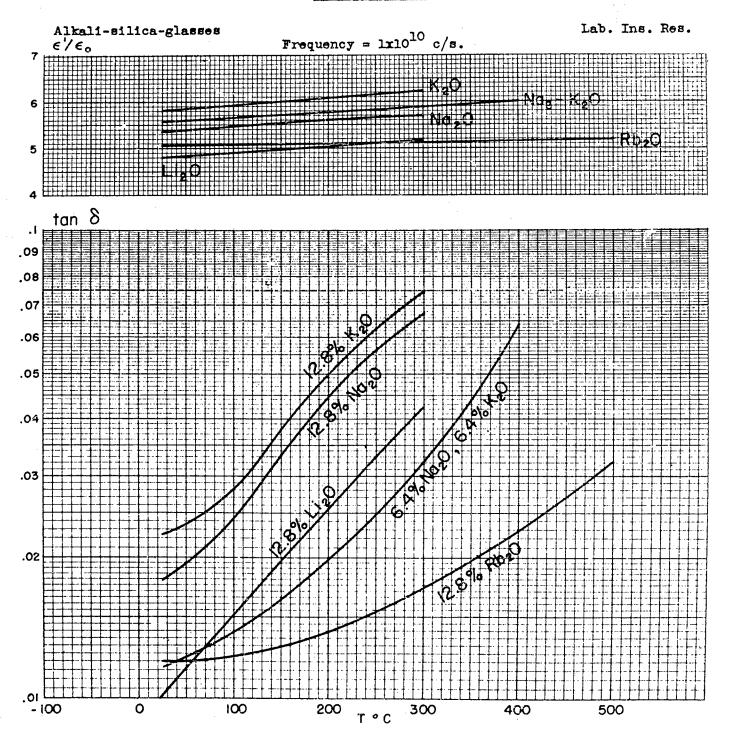




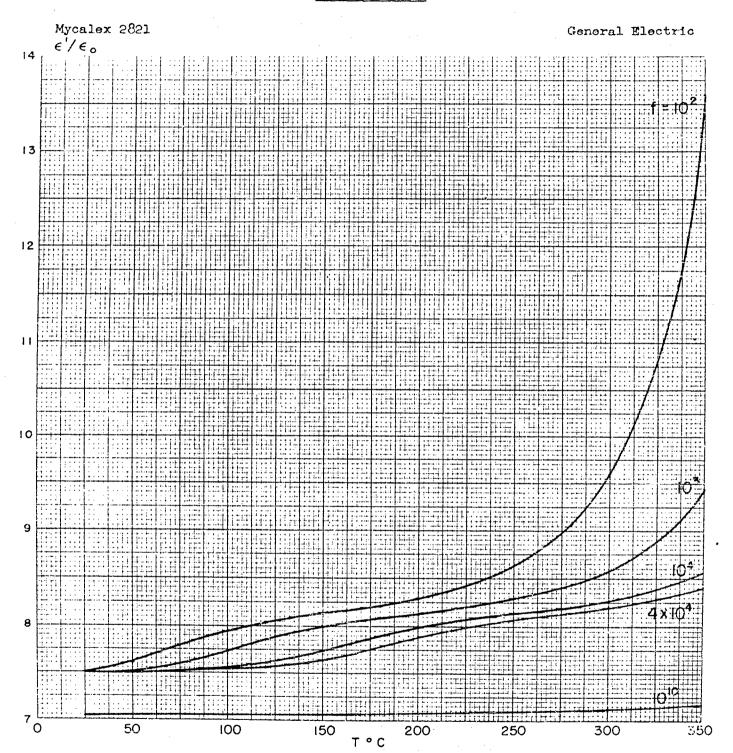




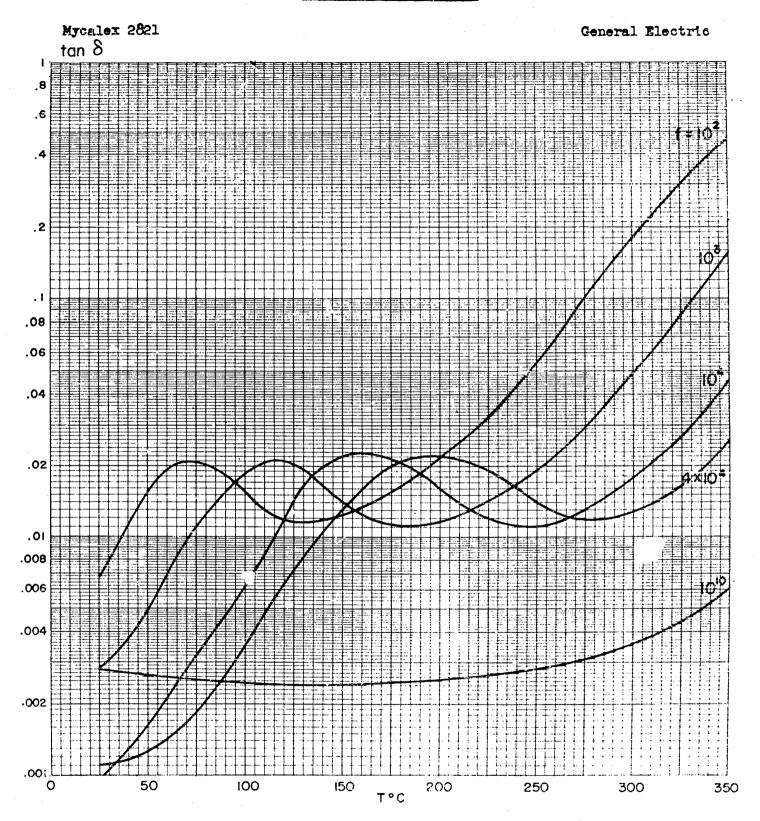




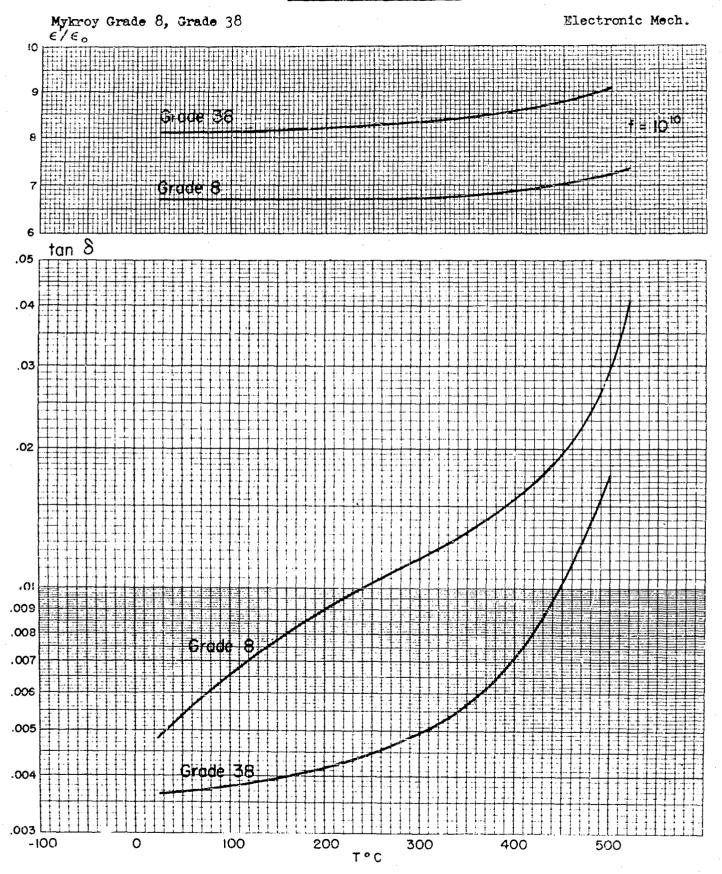
Mica and Glass



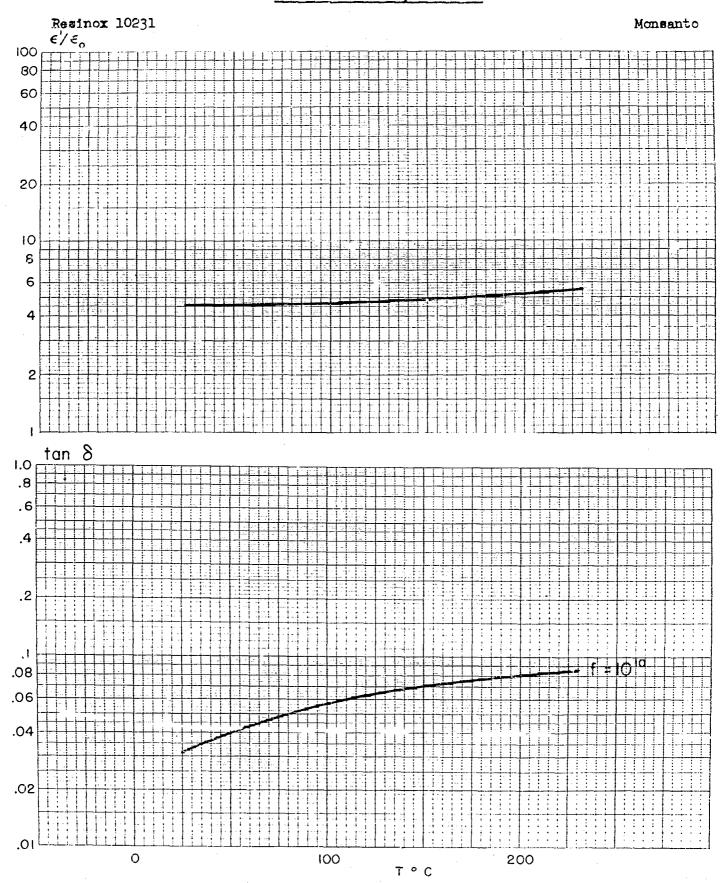
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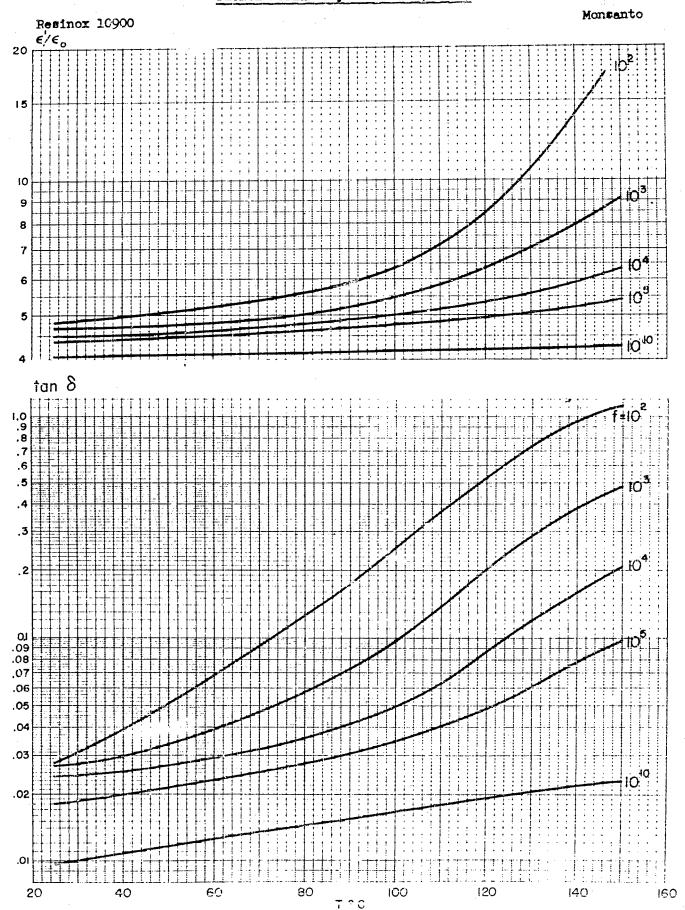


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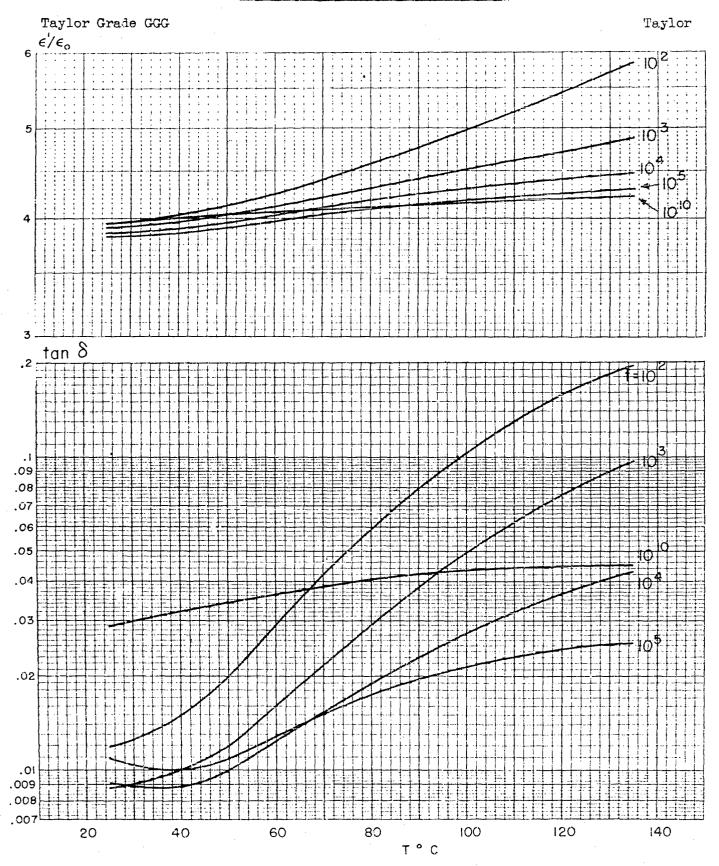


Phonol-formaldehyde Resins

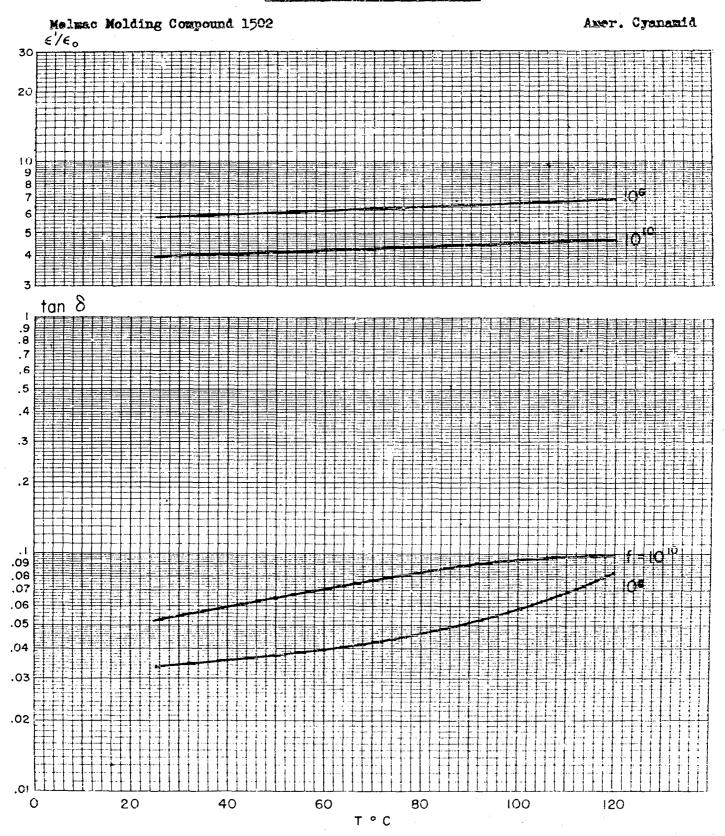




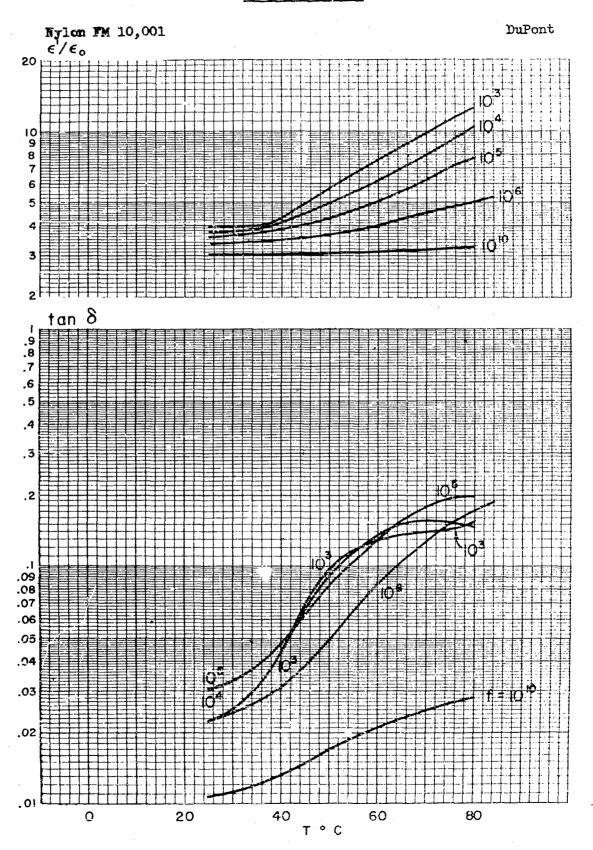
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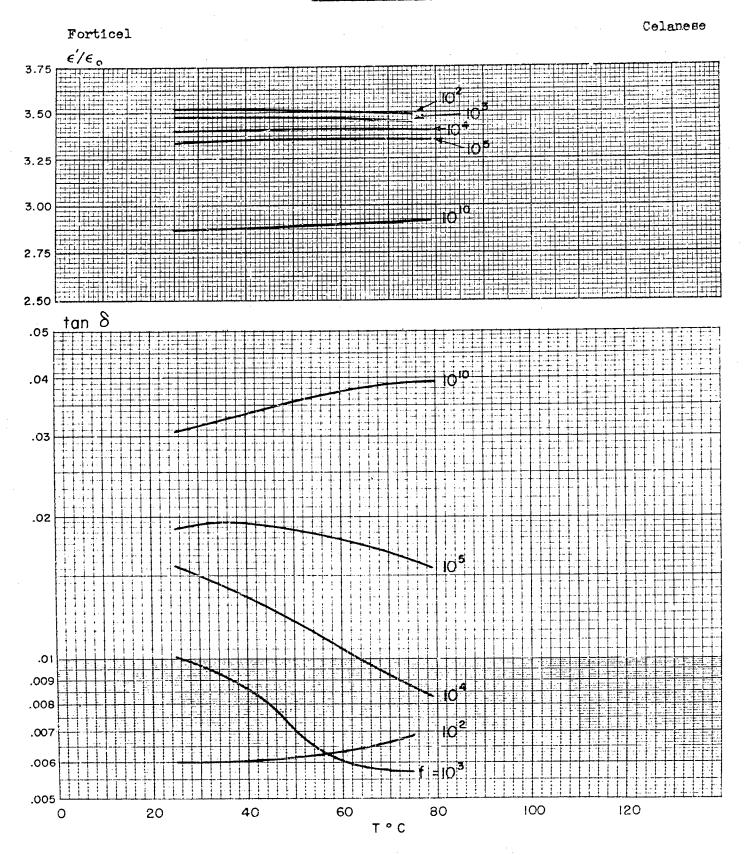
Molamina-formaldehyde Remin



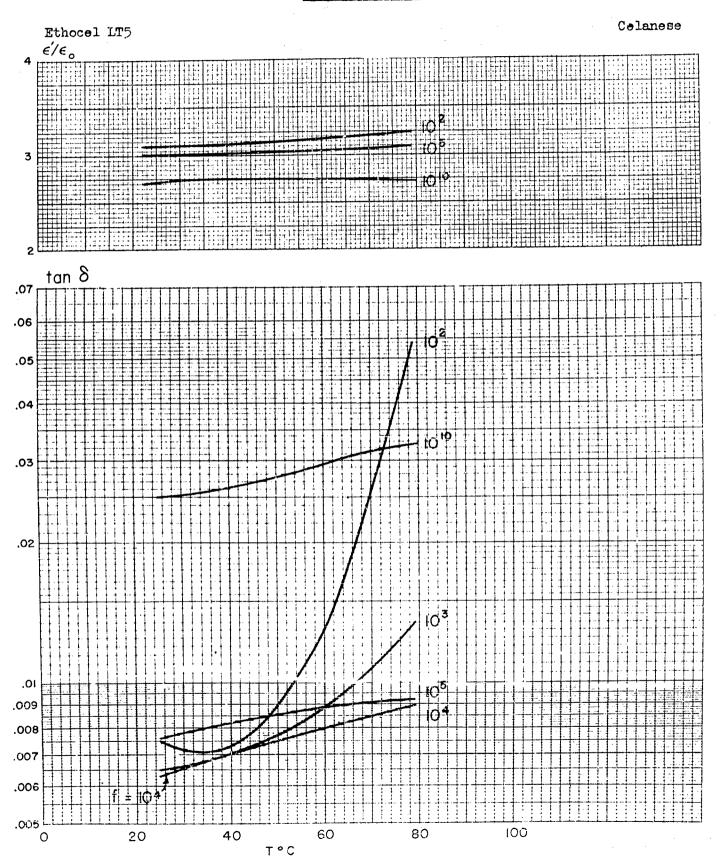
Folyamide Resin



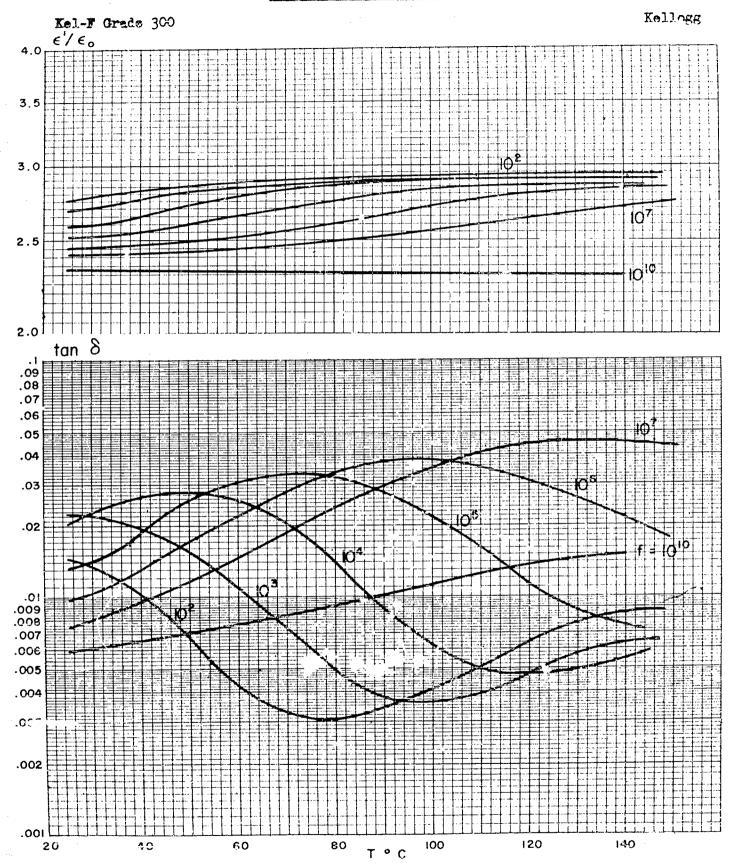
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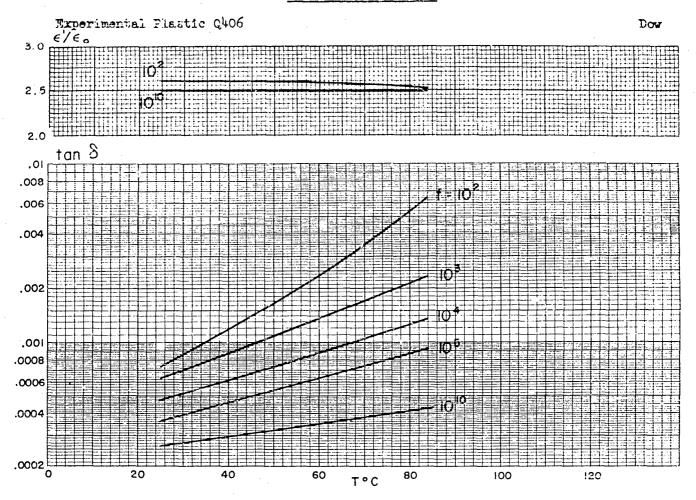
Ethyl Cellulose

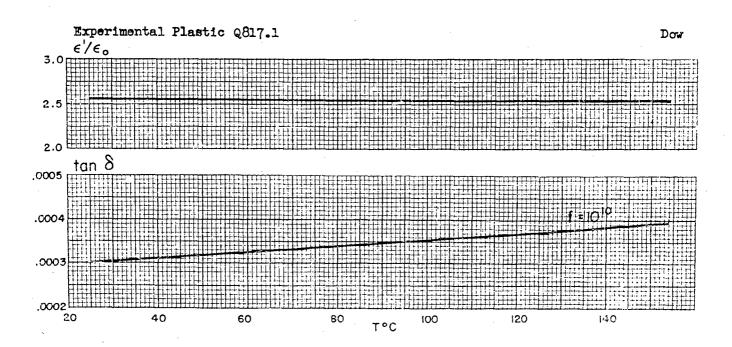


Polychlorotrifluorcathylene

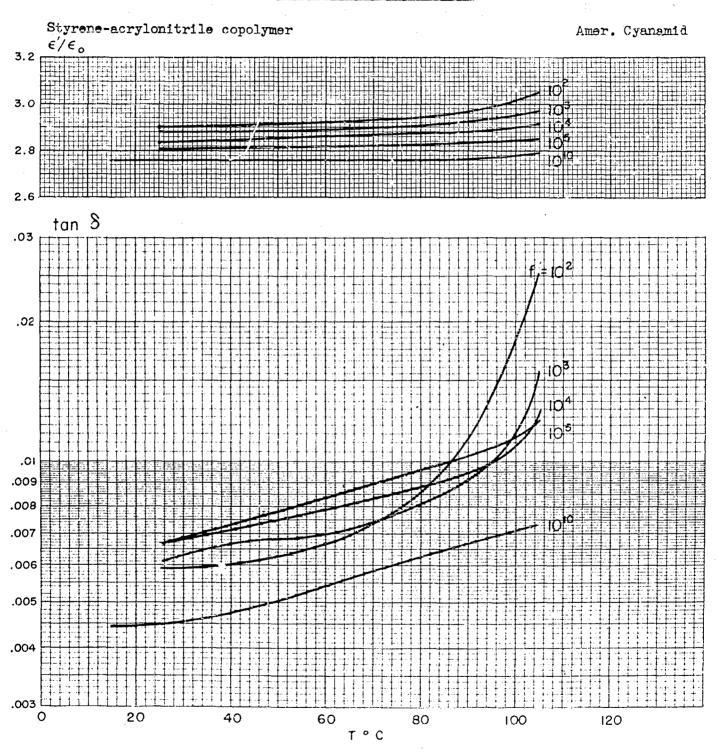


Miscellaneous Vinyls

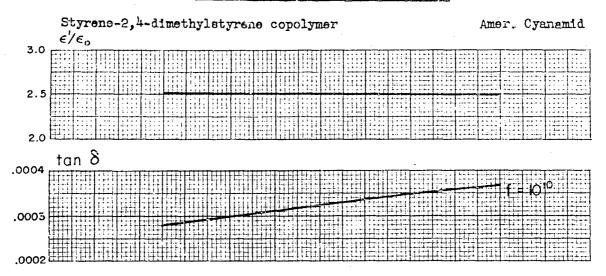




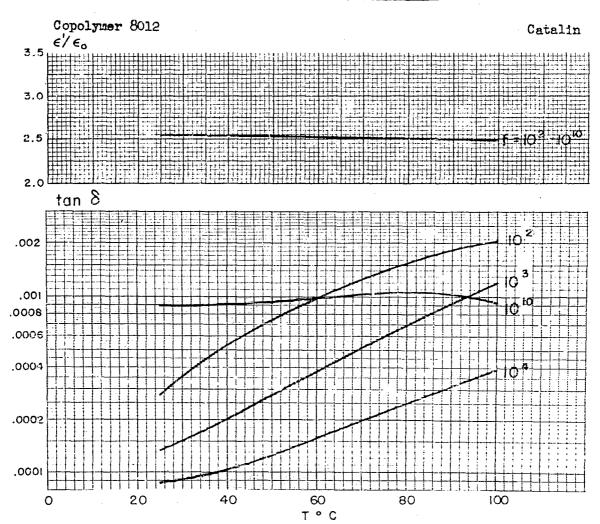
Styrene Copolymers, Linear



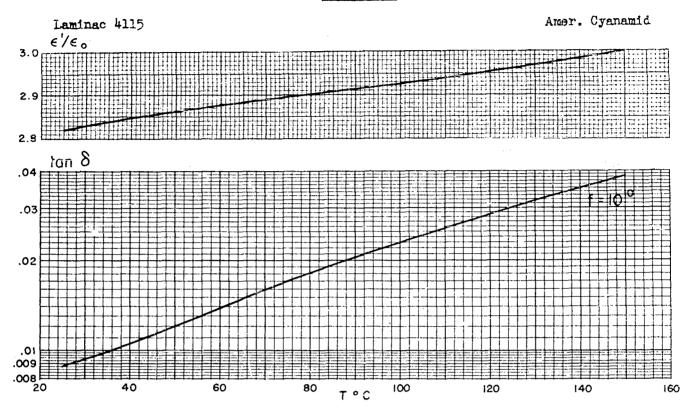
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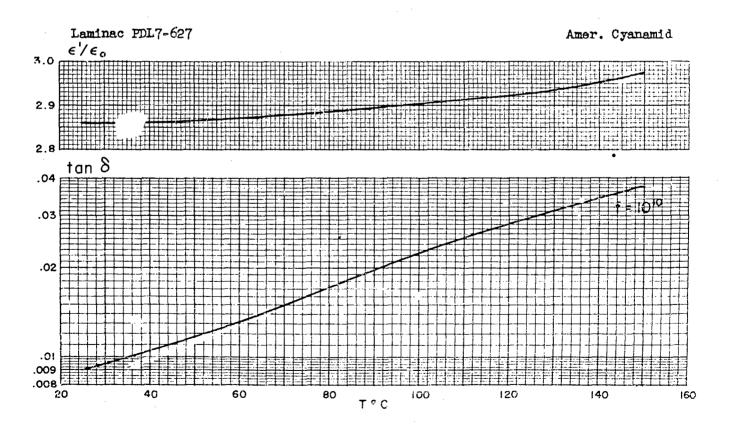


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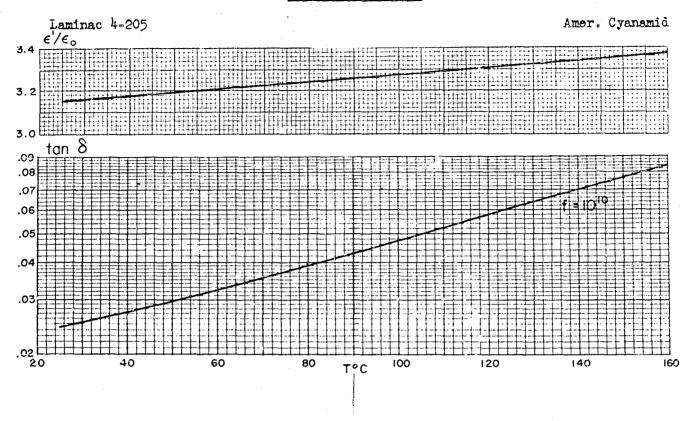


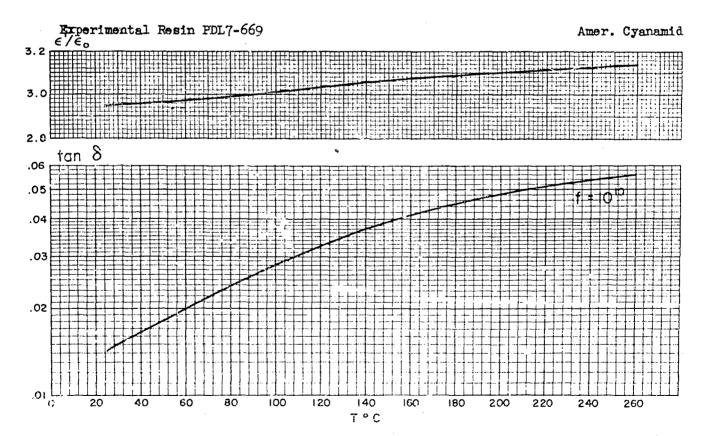
Polyesters



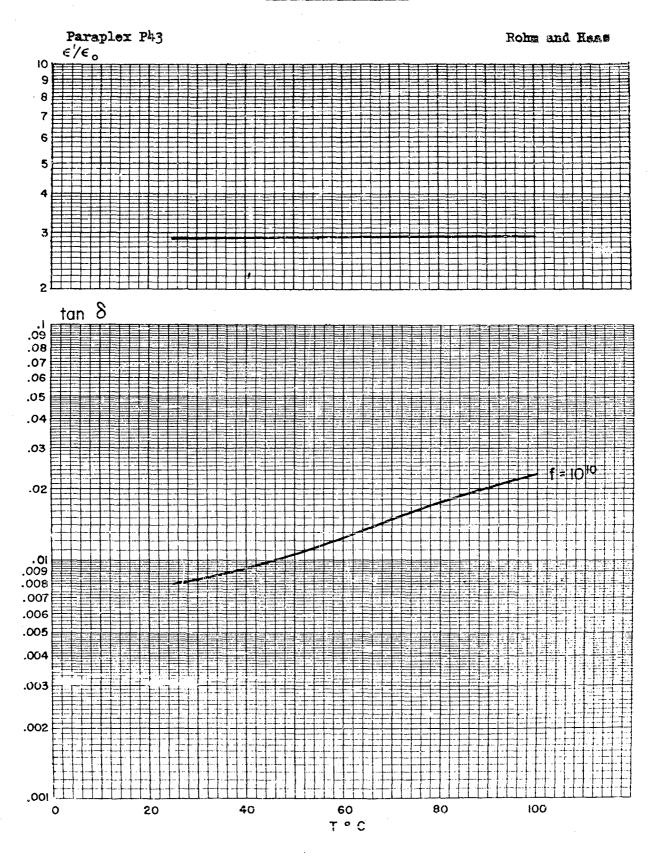


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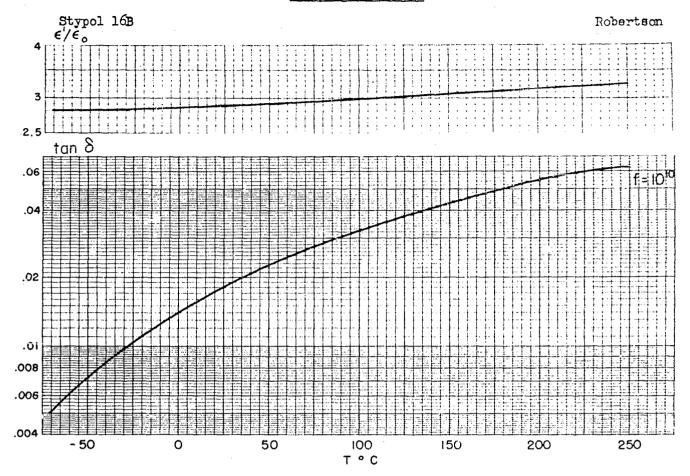




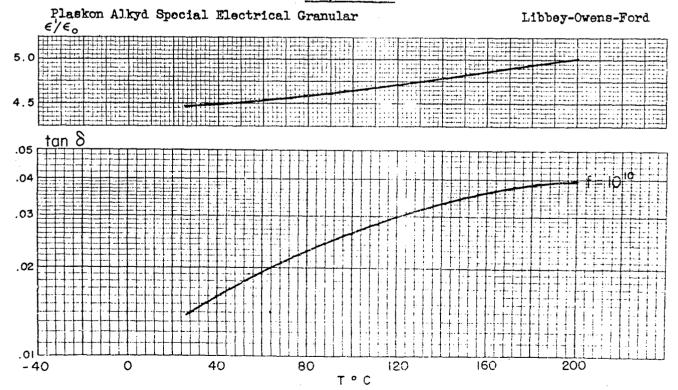
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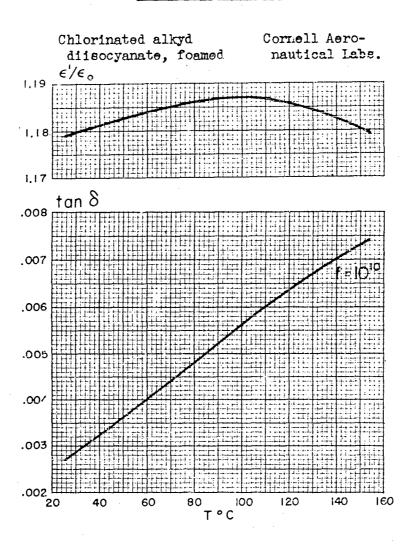
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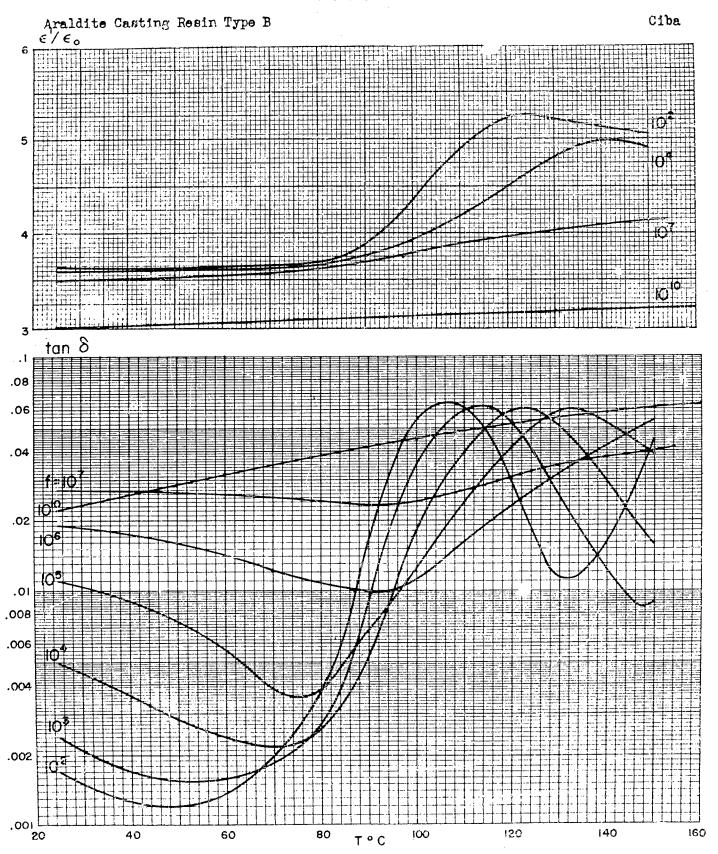
Alkyd Resins



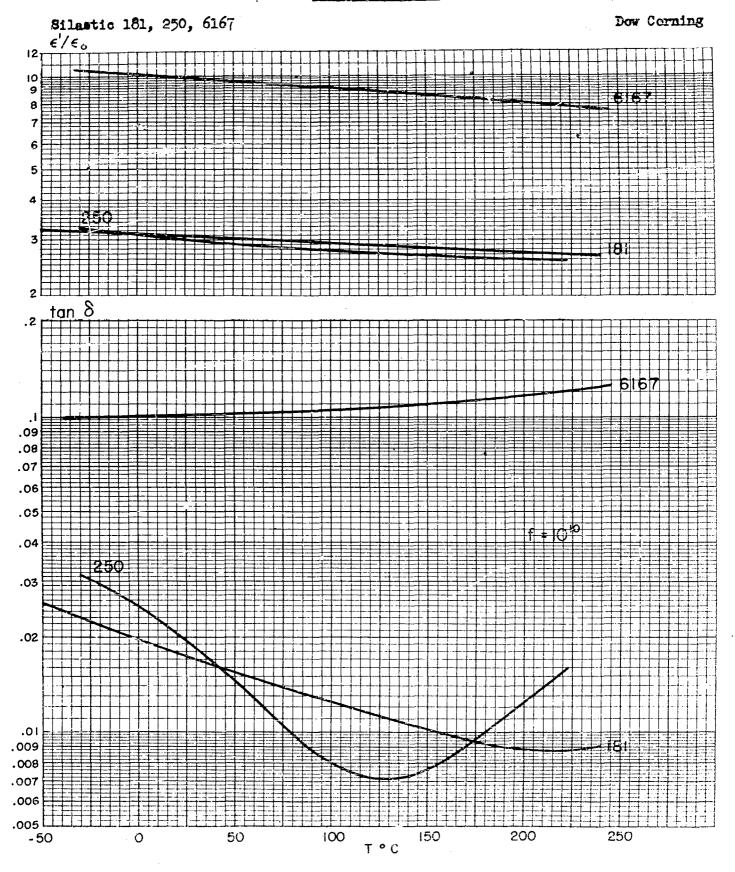
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